SCIENTIFIC AMERICAN

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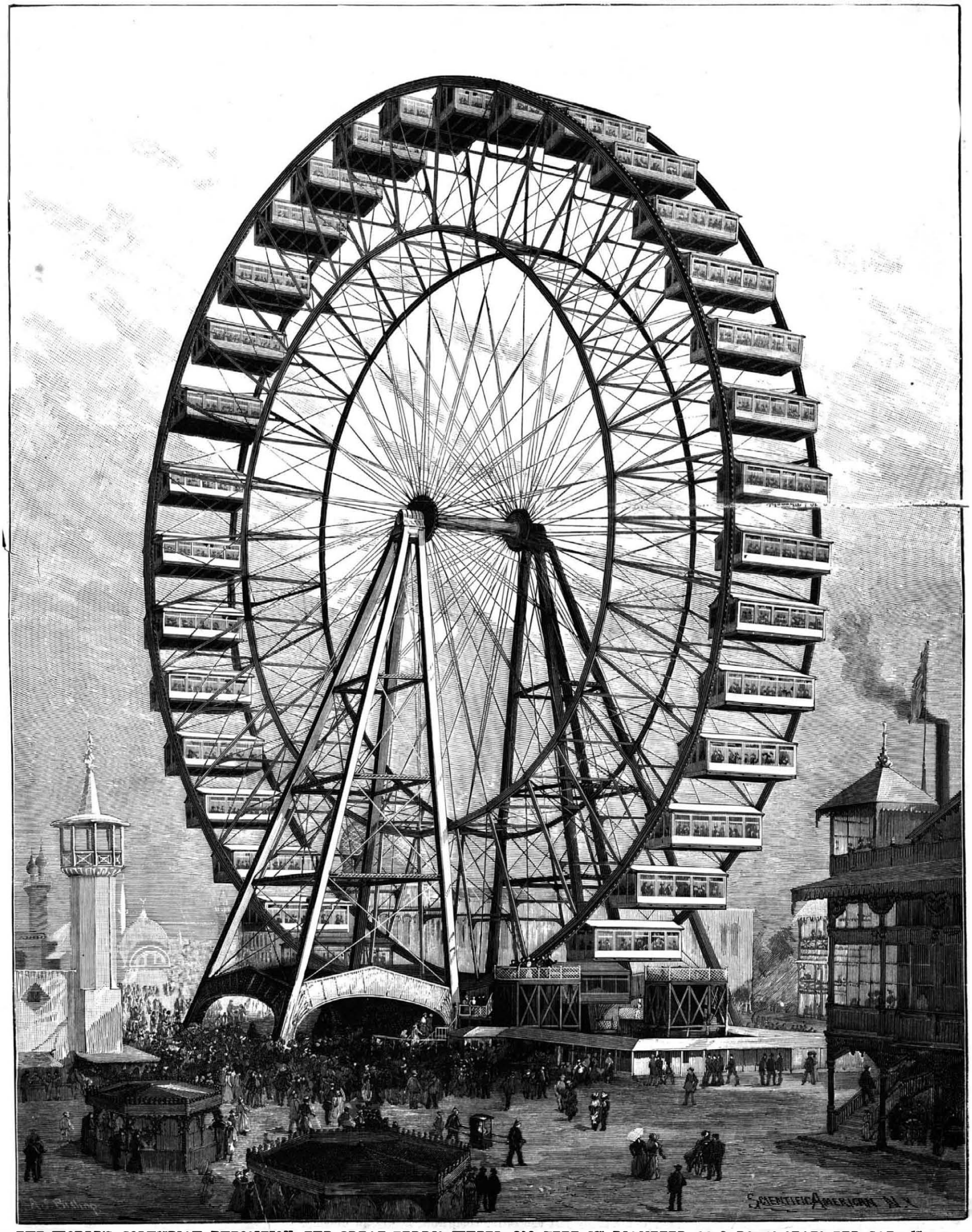

THE WORLD'S COLUMBIAN EXPOSITION—THE GREAT FERRIS WHEEL, 250 FEET IN DIAMETER, 36 CARS, 40 SEATS PER CAR.—[See p

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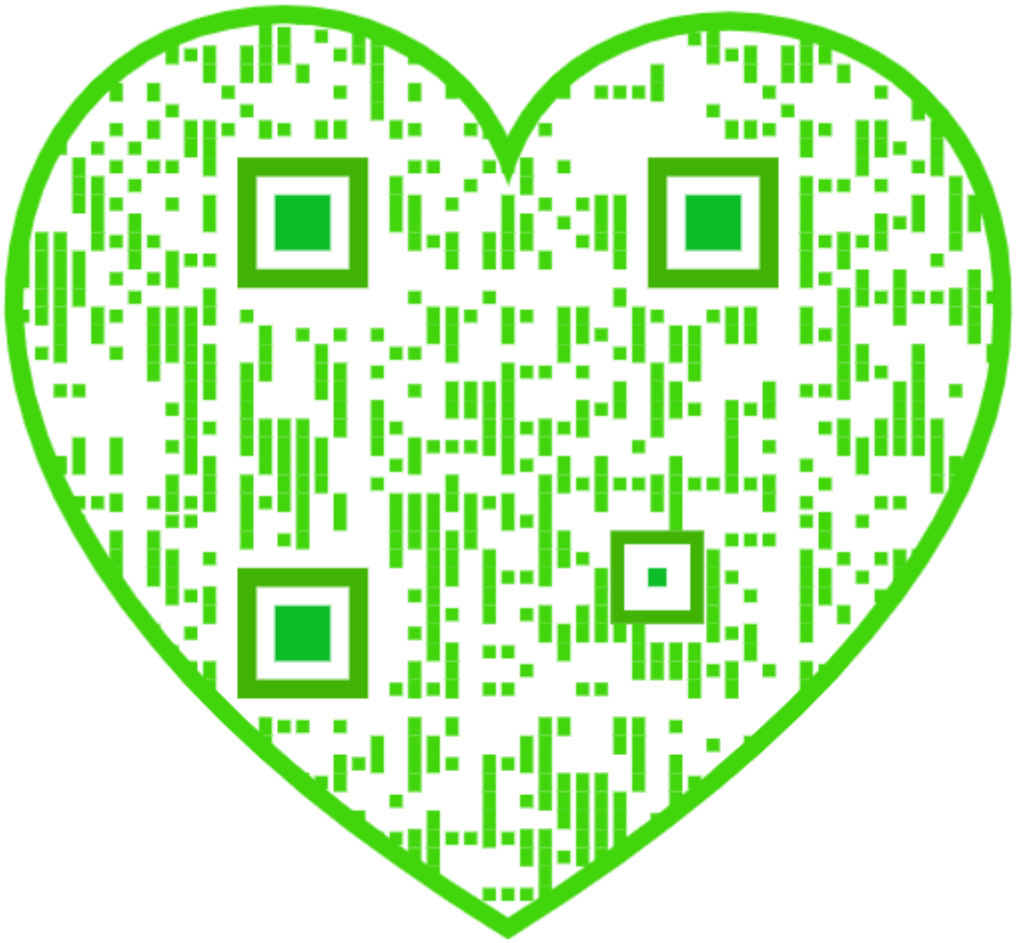

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SINKING OF THE BRITISH WAR SHIP VICTORIA.

On June 23, the British first-class battle ship Victoria, flagship of the Mediterranean Squadron, and carrying Vice-Admiral Sir George Tryon, K.C.B., was maneuvering off Tripoli. In the course of the maneuvers she came into collision with the British war ship Camperdown. The ram of the Camperdown struck the Victoria forward of the turret on the starboard side. In fifteen minutes the Victoria sank in eighteen fathoms of water. In sinking she turned bottom upward, and now lies in that position on the bottom. Announcing the disaster in the House of Commons, Mr. Gladstone said that there were 611 officers, seamen and boys, and 107 marines on board the ship. It was feared of this total of 718 souls, 430 had been lost. The Camperdown was injured in the collision and will require extensive repairs. The vice-admiral with a number of the officers were among the lost.

The Victoria had been several times illustrated and described by us, and on page 11 is a picture of the great ship, at one time the pride of the British navy. She was one of the most powerful battle ships in the world. Her length was 340 feet, beam 70, mean draught 26 feet 9 inches. The tonnage displacement was 10,470, the indicated horse power 14,244, speed developed in trial 17 3-10 knots. She was protected by a belt of compound armor, 18 inches thick, for about half the length of her hull, rising 2 feet 6 inches above the water. On the forward deck is the great turret, 17 inches thick, and inclosing the breeches of two 110 ton guns, mounted in parallel. These immense pieces of artillery carried 1,800 pound projectiles, the full charge of gunpowder being 960 pounds for each discharge. Aft of the turret came a strongly protected battery of 5 ton guns of 6 inch caliber, six projecting on each side through protected ports. Back of this structure came the stern gun—a 29 ton breech loader of 10 inch caliber. Triple expansion engines drove twin screws. She could carry a coal supply for 1,600 nautical miles, full speed, and at cruising speed for 7,000 miles. She was launched on April 9, 1887, from the Elswick yards of Armstrong, on the River Tyne; 150,000 persons witnessed the launch.

The above account is far from complete. Torpedo tubes, rapid-firing machine guns, a fighting mast, a most extensive system of hydraulic machinery, a heavily armored conning tower, and many other features in the ship cannot be more than mentioned within our limits. She was built to be the most powerfully equipped British war ship afloat. The Victoria was an example of the highest development of destructive capacity in a ship, and at the same time she illustrated the great weakness of these monuments of modern naval science. By accidental collision with a sister ship, in a quarter of an hour this vessel, representing £800,000 sterling of value, ignominiously turned turtle and sank, bottom upward, carrying over 400 men with her. Not only was the weakness of an attacked ship shown, but the Victoria in being sunk with this dreadful loss of life was an instrument in showing the weakness of the involuntarily attacking vessel. It was only at the expense of damage to her own structure that the Camperdown, striking her sister ship below the armor, penetrated the iron hull with her ram. It is not long since the British ship Howe, with her bottom pierced by a rock, sank in the harbor of Ferrol, Spain.

The British turret ship Captain went down at sea. To descend from greater to less calamities, numerous instances can be cited of collisions between war ships and the minor vessels of commerce, the war ships suffering in the encounters. Even during the recent naval review on the Hudson, some damage was done to the ships of war by these collisions. It is evident that one point of construction is insufficiently provided for by modern naval engineers in war vessels. This is the rendering them unsinkable. They are necessarily topheavy, and their enormous weight and relatively small freeboard in many cases makes them peculiarly liable to destruction by sinking and capsizing. The efficacy of the ram as a weapon is also exemplified in this deplorable affair, the Camperdown giving a practical example of the use, or rather misuse, of the ship as a quasi-projectile. A very thorough system of bulkheading, both longitudinal and transverse, seems to be the only suggestable way of disposing of the points of weakness.

THE GREAT FAIR.

One of our weekly New York papers, justly noted for the excellence of its illustrations, prints the following as a caption to an editorial, "A Fair or a Fiasco?" Such articles have a tendency to do harm. If the Fair is a failure, the press of America will have its full share of blame to answer for. From the very first the papers all over the country, not even excepting those of Cook County, have poured forth their vials of wrath upon the devoted head, not of a "Chicago Fair," but on the World's Columbian Exposition.

During the first days of the Fair there were no doubt many just causes for complaint, nearly all of which are now settled in a satisfactory manner, and even the photographic nuisance has been abated. After the Fair has been in operation over six weeks, or one quarter of the allotted period of exhibition, it really seems time to call a halt. It is now time to sit down and enjoy the rare treat which has been prepared at such cost of labor and money. Good natured banter or just criticism will not injure the Fair, but when every altercation at the gates is magnified into the proportions of an international episode it ceases to be a joke and tends materially to injure the Fair. The stories of extortion, quarrels among officers and the incomplete state of the Exposition have kept many thousands away during one of the most charming months in which the gates will stand open. Take the advice of the circus manager, who at the close of the afternoon performance said (in reference to the evening), "Come yourself and bring your children." Let it be said to the credit of the American people that the great Exposition, which has cost in round numbers $34,000,000, is the grandest affair and the grandest success of our day and generation.

PROPOSED SUBMARINE WAR BOATS.

The Fifty-second Congress appropriated the sum of $200,000 to build and experiment with a submarine torpedo boat. Nine bids for a submarine boat have been opened and referred to the Naval Ordnance Bureau for examination. Secretary Whitney asked twice for similar bids, so that this is really the third call which has been made for such a boat, and it is noteworthy that this call has brought out a larger number of bids than before. Only three out of the bids submitted contemplate the actual construction of the boat, for the advertisements for proposals were so worded that a poor inventor might submit his design, which, if accepted, the government would buy and contract for the construction of the vessel where they chose. There is no doubt a good submarine torpedo boat would do much to revolutionize modern naval warfare.

A surface torpedo boat, owing to the high speed required, must of necessity be built very light, which of course exposes it to the destructive fire of the machine guns, for the torpedo range is very short as compared with that of a naval gun. A submarine torpedo boat should have the advantage of being able to sink when approaching a vessel, so that the fire of the rapid-fire guns can do no harm. A semi-submerged torpedo boat can be easily constructed with an armored turret, but the aim of inventors should be to produce a boat which can be instantly submerged, capable of maintaining a good speed under water, the course to be directed accurately, and to be able to fire the torpedo in an effective manner without danger to the boat itself.

Early Steam Navigation.

The Liverpool *Journal of Commerce* has the following article on early steam navigation:

"With the increase of trade and population there is a progressive demand for steam navigation facilities. Without sufficiency of cargo and passengers to make a venture pay, or no help of a bounty or subsidy when traffic is sparse, financial success is out of the question. Prejudice or ignorance may, however, serve to stop progress.

"The Grand Treasurer of Spain did not believe in the safety of vessels propelled by steam, and he retarded the introduction of ships propelled by that agency. On the 17th of June, 1543, the La Santissima Trinadada, of 200 tons, was driven at the rate of one league per hour in the roadstead of Barcelona, in the presence of the Emperor Charles V., his son, Philip II., and several high dignitaries. The Treasurer, Ravage, believing that a boiler used for such a purpose would burst, denounced the enterprise, but paid the inventor, Don Blasco de Garragher, his expenses. ('The Ship,' by Francis Steinitz. W. H. Allen & Co., Leadenhall Street, London, 1843.)

"From several official sources it is made evident that the practical application of the steam engine to marine propulsion was an accomplished fact three centuries and a half ago. Seagoing steamers date from the building of the James Watt by John Wood & Co., in 1818, for the Leith and London trade. The Soho and Monarch were subsequently constructed for the same company. All three ships were built at Greenock, the birthplace of James Watt, and of William Laird, who settled in Liverpool and established a line of steamers from the Mersey to Dublin in 1822. The James Watt, Monarch, and Soho were purchased by the General Steam Navigation Company, and employed in their service for many years. Hull and machinery did their work admirably. They were built of wood, and had paddle wheels. All three were in existence a few years back as coal hulks. The James Watt was the first deep-water steamship built in Europe. The Savannah, American-built boat, which came to Europe, can scarcely be called a machine-propelled vessel, but may be classed as an auxiliary-driven ship."

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Every day brings more people to the World's Columbian Exposition, but, even with the greatest attendance, the grounds do not seem to be overcrowded. Even on such a day as June 15, which was German day, and brought an attendance of 200,000 within the grounds, there was no uncomfortable crowding, except in the vicinity of the German building, where the formal exercises of the day were held. The most discomfort from crowding is experienced by visitors who wait until the last minute before leaving the grounds. This is always a time when the majority of people are seeking transportation home, and no facilities could be so ample as to handle in a few minutes crowds varying from 50,000 to 150,000 or more.

In the Manufactures and Liberal Arts building there are always people watching the interesting exhibits in the department of horology, which faces Columbia Avenue just north of the clock tower. One of the most drawing exhibits in this department is that of the American Waltham Watch Company. The attractive feature of this exhibit is the automatic machinery in operation for making different parts of the works of a watch. There are ten of these automatic machines, each of which is of most remarkable mechanism, and which seems to have as delicate a touch and to possess the intelligence of a skilled workman. These machines are in operation adjoining the aisle, so that many people can be accommodated to observe them. Inside the pavilion is a large collection of historic and antique watches. Among the more famous of these watches are those that belonged to King James I., Oliver Cromwell, John Milton, Sir Isaac Newton, Queen Elizabeth, John Calvin, John Bunyan, Lady Jane Grey, and Robert Burns. This collection contains over six hundred watches. They represent all sizes and shapes, and are of great interest because of the variety of their mechanism.

Another exhibit in this department, which attracts a great deal of attention, is that of the Waterbury Watch Company. In this pavilion several bundred Waterbury watches are shown, both in cases and the movements. But what draws the crowd to this exhibit is the Century Clock, which has required years of work in construction and which has cost the company $80,000 to complete. This clock records the hour, minute, and second, gives the day of the week, the day of the month, the month of the year; records the movements of the tides in New York harbor, gives the changes of the moon, etc. Immediately under the dial is a large picture of the factory of this company, and under this picture is a reproduction of the train room in the factory. Here are represented twenty-six girls at work at lathes, pinion cutters, and other machines, reproducing in close detail every movement that would be seen in actual life. The figures are ten inches tall, finely carved from wood. On the right are four more rooms with figures in miniature, which are reproductions of historical or other scenes. These represent miners at work in a mine, digging rock; the development of the sewing machine, with a man and woman sewing by hand in the back of the room, while a mechanic—supposed to be Elias Howe—stands at a bench making a model of a sewing machine, and two women are operating modern sewing machines in the foreground. Underneath this is a telegraph and telephone room, with a man in the foreground in the act of telephoning; several operators at work at telegraph instruments, people coming and going with dispatches, messenger boys running in and out, etc. The other scene is an electrical one, with a Corliss engine operating a dynamo, and an electrician—representing Leo Daft—experimenting and watching the results of his experiments. On the left side of the clock is a saw mill scene; a scene representing a cotton plantation, with Eli Whitney testing his first model of the cotton gin, and bales of cotton lying about and colored men at work. Another scene represents the flax industry, with men and women whipping the flax and otherwise preparing it. The fourth scene represents an old style German watch factory in a peasant house, with two men at work at a bench, a maid serving beer and lnnch at a table, etc. The figures in these scenes were all carved in this country, and reproduce movements of the human arm and hands with much accuracy. In addition to these scenes there are many carvings on the clock which represent important events in the history of the country during the past century, beginning with the signing of the Declaration of Independence. The machinery in this clock is operated by an electric motor one-half horse power, and the nine scenes, representing the several industries, are illuminated with miniature incandescent lamps. Another interesting exhibit in this department is that of the Ansonia Clock Company, which exhibits an infinite variety of clocks of all sizes, from the cheap nickel clocks to most expensive clocks, reaching hundreds of dollars in value.

Near this exhibit is the pavilion occupied by the Wm. Rogers Manufacturing Company. Here are shown knives, forks, and spoons in great variety, but the feature of most particular interest is that of the several operations required in making these. For instance, there is shown the steel bar from which the knife is made, and the results of the several operations through which this bar passes to become the knife ready to be plated. The making of spoons and forks is illustrated in the same way.

The Norway exhibit, in the Manufactures and Liberal Arts building, is remarkably instructive, and a study of it is like traveling in the country itself. The main structure is constructed of Norway pine, the design being representative of Norwegian architectural effects. An interesting feature of this exhibit is the large display of spoons, ornaments, and gold and silver trinkets manufactured of these metals and enamel. In much of this ware the enamel is transparent, and the filigree work is so fine and so beautifully done and the coloring in the enamel so rich in variety and effect that the exhibit is well worth close inspection. Many typical Norwegian things are, of course, shown. These include furs, mounted birds, traveling vehicles, native costumes, etc. On a raised platform in the pavilion is a stuffed reindeer harnessed to a sledge which is covered with skin from the hair seal, giving a truly Arctic effect. The ski, or snowshoe, so much used in winter in Norway, is shown in all stages of elaborateness. Not the least attractive part of this exhibit is a collection of photographs of mountains, fjords, villages, etc., which are beautiful specimens of photography, as well as of landscape scenery. Many richly colored photograph portraits are also exhibited.

In the gallery of the Electricity building are three exhibits which always have an interested audience about them. One of these is the exhibit of the American Electric Heating Company. Here are shown electric heaters in great variety for all purposes. Cooking is carried on the greater part of the time, showing the convenience and utility of this method of cooking. There are electrical water heaters, flatirons, ovens, etc. The exhibit of the Commercial Cable Company reproduces the writing and the method of cabling on ocean cables. The delicate devices used for this purpose and the difference in this method of transcribing messages from ordinary telegraphy cause much comment by people who had never suspected but what the two methods were the same. The exhibit of the Gray Telautograph Company adjoins that of the Commercial Cable Company. This remarkable invention was fully described and illustrated in the SCIENTIFIC AMERICAN of April 1. It can be seen in full operation, reproducing the writing sent by the transmitter.

In studying the exhibits made by Mongolian countries in the Manufactures and Liberal Arts building it is well to begin with Siam, and after studying this exhibit, take the Chinese next, and then the Japanese. The exhibit made by Siam is small and in its way is interesting. The pagoda it occupies is decidedly Oriental and is more fantastic and gaudy than other pavilions in the building. The exterior finish is composed of small diamond-shaped pieces of glass studded in gilt woodwork. The most attractive features of this exhibit are carved ivory and ornamental brasswork. In front of the pagoda are four huge tusks of ivory. So far as the art work of this exhibit is concerned, it is quite crude as compared with that shown in the Chinese exhibit. China, however, makes a comparatively small display, as the space it occupies is only about four times that occupied by Siam. This exhibit is rich in carved ebony furniture, much of it inlaid with pearl. There are several rich tapestries in silk, and beautiful specimens of carved ebony screens, carved ivory, etc. This exhibit is not made by the Chinese government itself, but by private individuals, which may perhaps in a measure count for its not being more complete. In itself it would be regarded as an instructive and choice exhibit, but when compared to the displays made by Japan, it appears almost rudimentary.

Too much praise cannot be given Japan for its exhibit in this building, and adjectives would be quite useless in attempting to describe it, because of the exquisite workmanship and touches of art that are seen in such abundance throughout the whole exhibit. The space occupied is very large, containing more area than the exhibits of other countries, with the exception of three or four of the larger nations of Europe. The collection and variety of bronzes of all kinds is superb and should not be neglected by visitors at the Exposition whose time is very limited for looking about. The display of silk goods, carved wood and ivory, porcelain, lacquered work, in shortall Japanese wares, is very complete. The pavilion was constructed by Japanese artisans who were brought over for the purpose. It is a fine specimen of Japanese architecture and is one of the most attractive and ornamental structures in the building. It is of true Oriental type and is not built of staff. This exhibit faces Columbia Avenue and is in the north end of the building.

Last week reference was made in these columns to the exhibits made by the Canadian Pacific and the London and Northwestern Railway in the Transportation building. In some respects the exhibit made by Germany in the railroad department is more complete, because of its variety, than that made by Great Britain, although historically it is not of so much value. Two locomotives are shown; one is a compound freight locomotive, the other is an engine for local service. Both engines are excellent specimens of workmanship, and attract much attention from their difference in design from the large display of American locomotives adjoining. A very elaborate passenger day coach is shown on the same track as the engines. This coach is constructed on the American plan, but is not over three-fifths the length of our usual type of coach. This coach is painted a rich blue on the exterior. It is constructed mostly of pressed steel and iron. Much of the interior finish is wood and bronze, while the draperies are silk. Two open cars are shown, such as are used for freight service. Very little wood is used in the construction of these cars, the truck and framework being almost wholly of pressed steel. These cars have a single pair of wheels to a truck. The regular type of German compartment coach is also shown on this track.

The statue of Columbus, designed by Bartholdi and made of silver, requiring thirty thousand ounces for the purpose, has been placed in position in the exhibit of the Gorham Manufacturing Company in the Manufactures and Liberal Arts building. The figure is fully life size, and stands immediately in front of the exhibit in this pavilion in the entrance way. In many respects this is the strongest statue of Columbus that has been shown in Chicago. It represents the discoverer first seeing land.

The inauguration of the great Ferris Wheel took place on the 21st June, and was a very happy affair. A large number of guests were invited, speeches were made by several distinguished persons, and many compliments were showered upon the engineer and projector of the wonderful machine, Mr. G. W. G. Ferris, of Pittsburg, Pa. Several illustrations of this remarkable piece of mechanism will be found elsewhere. The charge for a ride in the novel machine is 50 cents, for which the passengers enjoy two revolutions, occupying half an hour. If all the seats are full, the company take in $1,440 an hour. It is truly a wheel of fortune for its owners.

The loss of the British battle ship Victoria made a great sensation among the exhibitors and visitors at the Fair. When the news came, on the 23d instant, a sad interest was at once created to examine the splendid model of the vessel, which occupies a conspicuous position in the Transportation palace. Thousands of people flocked to see the model, which model is a large one and very perfect. There is a double stairway with brass railings around the model and platforms.

A new feature was introduced at the Exposition on Massachusetts day, June 17, which was a decided novelty. This consisted of a parade, in which all the concessions on the Midway Plaisance were represented.

The Laplanders led the procession, followed by the Amazons, whose color was superb. The Libby glass works sent a couple of hundred of their employes, each with his glass cane and badge of spun glass. The swarthy glass blowers from Murano followed. The Mongolian orchestra gave their usual rendering of discords, while stately mandarins rode on horses. A huge dragon nearly one hundred feet long was supported by twenty-five Chinamen, who caused the dragon to undulate in a becoming manner. Breton peasants in blouses and wooden shoes came from the French wine press. The Swiss guards attracted much attention. Amid a wailing of pan pipes and tom-toms came the Algerians, including the dancers. Then came the inhabitants of the most interesting part of the whole "conglomera," the Cairo street. Priests, with all the pride of their heritage of thirty centuries, carried aloft the sacred vessels and utensils of their heathen rites; the donkeys and camels followed with the veiled women, the wrestlers and the dancers. The Persians followed with their wrestlers, whose bodies were rubbed with oil, which brought the great knotted muscles into relief. A clatter of hoofs announced the approach of the Bedouins of the desert, who were mounted on little horses of the purest Arabian stock. They brandished long spears, and the noble carriage of these wild people and their magnificent horsemanship charmed all beholders. The procession became wilder as the South Sea Islanders approached, dancing their weird, awful war dance. The procession was an unqualified success, and was seen by thousands who occupied the line of march. The frequent repetition of this parade will give life and color to the Exposition and will doubtless induce many to visit the Plaisance who for lack of time might

(*Continued on page 7.*)

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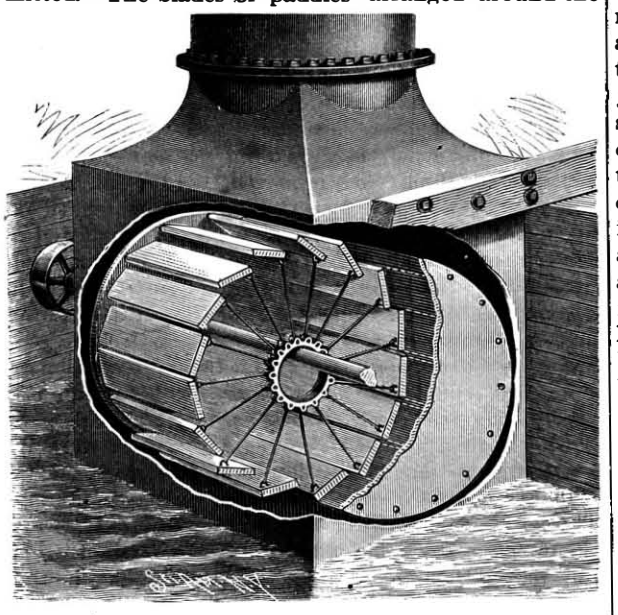
AN IMPROVED WATER WHEEL.

The simple form of wheel shown in the illustration is arranged to be operated so that the water passing though the flume twice exerts its force on the wheel, each paddle being twice acted upon by the water at every revolution of the wheel. The improvement has been patented by Mr. Asa B. Frame, of Boyden, Iowa. The wheel has circular end pieces carried by a shaft journaled in bearings in opposite sides of the flume, the shaft having a pulley from which power is transmitted. The blades or paddles arranged around the

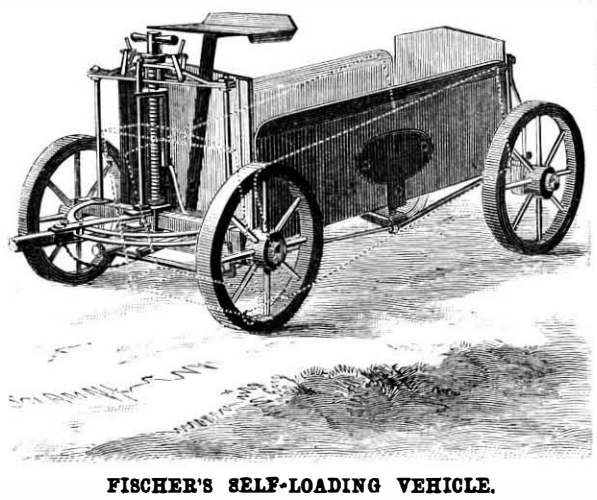


FRAME'S WATER WHEEL.

wheel are each pivoted at one edge at both ends in the outer edge of the circular end pieces, and the center of the other edge of each blade is connected by means of a rod with a ring hung loosely on the central shaft. Any number of these rings may be used, according to the size of the wheel, an independent rod connecting the ring with each blade. As the ring hangs by gravity on the shaft, the inclination of each blade relatively to the center shaft is constantly changing as the wheel revolves, each blade as it approaches the top being brought into a nearly horizontal position to receive the full force of the water, the blade being then tilted to a nearly vertical position as it passes down through the water, and again being shifted to a horizontal position at the bottom, where it receives the force of the water a second time, to be afterward thrown back into the vertical position again, so that it passes easily up against the current of the water. The blades at the top and bottom of the wheel, upon which the water exerts its force, are each designed in their varying positions to afford an equal amount of power in proportion to the amount of water used.

IMPROVED SELF-LOADING VEHICLES AND DUMP WAGONS.

In the improvements represented in the accompanying illustrations, for which two patents have been issued to Mr. George F. Fischer, of No. 235 Jay Street, Rochester, N. Y., it has been the design of the inventor to furnish trucks which are light, simple, strong, and which can be taken apart and put together quickly and with great precision.



FISCHER'S SELF-LOADING VEHICLE.

FISCHER'S RAKE ATTACHMENT FOR WAGONS.

The front portion of the body of the self-loading vehicle consists of a horizontal, skeleton, segmental frame, which supports the front board and serves as a guide for the clevis to which the pole is secured. Beneath this frame is a shovel, whose bottom is inclined downward and dish-shaped, the shovel being mainly supported by a yoke whose upright members are threaded at their upper ends and connected by a truss, centrally through which passes a vertical adjusting screw connected at its lower end with the shovel, and having a handle or cross bar in easy reach of the driver. By turning this screw in one direction the shovel is lowered, and the opposite turning of the screw raises the shovel. The adjusting screw is also adapted, by an adjustable connection, to raise and lower a dumping block having attached links adapted to engage the body of the wagon near its forward end. The wagon body is made in two L-shaped sections, the sections being practically hinged at their angles upon truss rods. When the body is in position to carry a load, the horizontal members of these sections closely approach each other, but they may be readily opened and carried to a dumping position by operating the adjusting screw to move the dumping block and links connected with the horizontal or bottom portion of each section of the body. The wagon body is independent of the front board and of the tail board, and the latter has a hinge connection with the rear axle. To load the wagon, the turning of the adjusting screw lowers the front portion of the body and the shovel until the latter strikes the ground, when, by driving the team forward, over or through a pile of coal, sand, gravel, or other material to be loaded, the latter is forced upward into the wagon body, and the body is then brought upward into its carrying position by turning the screw in the opposite direction. To dump the wagon, the dumping block is operated through a changed connection with the adjusting screw, so that by turning the latter the bottom members of the body are forced downward and outward, the side members being forced inward and downward, whereby the load is dumped, the body being subsequently returned to its normal position by turning the screw in the opposite direction.

The rake attachment is especially designed for dump wagons, and it provides means whereby the dirt, gravel, or other material dumped may be readily lifted and distributed over a large area. Its construction is such that it acts automatically with the dropping of the material from the vehicle, and when the latter is returned to a carrying position the rake is restored to its normal place at the rear of the wagon body. Upon the rear axle are two vertical guides in which the tail board is adapted to have a pivotal movement, and on each rear wheel, near the hub, is an eccentric flange. The body of the vehicle is in two longitudinal L-shaped sections, as in the self-loading wagon above described, the sections turning upon truss rods passed through blocks on the axle and through the lower ends of the guides and the tail board. The lower portion of the tail board extends beyond the sides of the body, and on its lower edge are teeth adapted for raking purposes. From each side of the upper portion of the tail board extends a bracket in which turns the upper end of a vertical shaft upon which is a spiral thread having a long outside pitch, and the lower end of each shaft carries a rake-head provided with teeth. Each shaft passes through a keyhole slot of a reciprocating block, a jaw of each of the blocks receiving the eccentric flange near the hub of each rear wheel. When the tail board is in its upper position the rakes are folded inward beneath the axle, but when the load is dumped the downward movement of the body of the wagon forces the tail board downward until the teeth on its lower edge engage the material dumped. As the tail board drops, the threads of the vertical shafts are drawn through the reciprocating blocks, and the rake heads carried by these shafts are thrown outward back of the rear wheels and diagonally across them. When the wagon is now drawn forward over the material dumped, the shafts are rocked by means of the reciprocating blocks, so that the rake heads are carried from their outer position to the center of the tail board and then back again, quickly spreading the dumped material over a large area, the work being done by the vehicle and the team.

The Telegraph in China.

The United States minister at Peking, China, reports to the State Department that the Chinese telegraph system has been connected with the Russian system, so that messages may now be sent overland between any part of China, Russia, Europe, and by cable to Africa, North and South America, and Australia. The whole world is now wired and telegraphically connected.

FOOT RACE OF MARKET PORTERS AT PARIS.

Everybody knows those strong market porters who carry upon their backs bags of flour that sometimes weigh 150 pounds. They are lusty fellows, with square, massive shoulders, who are endowed with extraordinary physical energy.

We have thought it of interest to record the feat that has just been executed by one of the most remarkable of them, Jean Labasse, the victor in a race of a new kind, got up by a Parisian journal. It was a question of starting from Feydeau Street with a bag weighing 220 pounds and proceeding to the *octroi* of Corbeil, a distance of 19 miles. There were ten competitors. The start took place at 8 o'clock in the morning of the 6th of March. Each porter carried upon his shoulder a bag containing a mixture of sand and sawdust weighing 220 pounds. Jean Labasse was the first to arrive, at 10 o'clock at night, having traveled the distance of 19 miles in 14 hours.

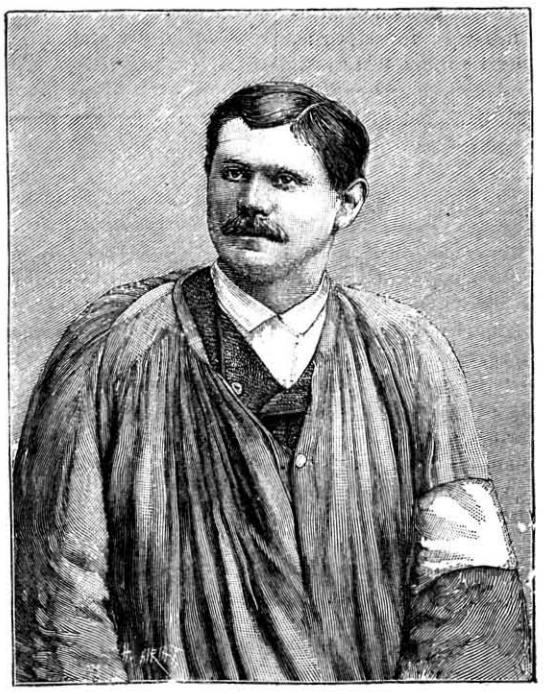


Fig. 2.—PORTRAIT OF JEAN LABASSE.

Labasse was born at Saint-Andre-d'Appel, in Dordogne, March 19, 1869, and is consequently twenty-four years of age. He is 5 feet 9 inches in height,

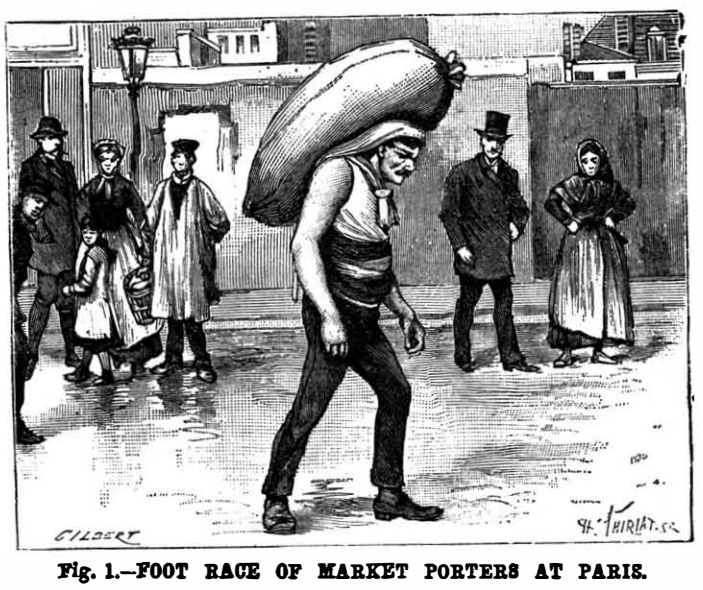


Fig. 1.—FOOT RACE OF MARKET PORTERS AT PARIS.

and of herculean strength. At the time of the race, he rested but twice on the way, first at Juvisy, after making 14 miles, and next at Evry-Petit-Bourg, at about 3 miles from the goal. He distanced all his competitors by several hours. He was not much fatigued at the finish.

Received at Corbeil by the municipality and a flourish of trumpets, he was the object of the ovations of the population, which had been awaiting him since six o'clock in the evening.

Although Labasse is remarkable by the development of his muscles, we must add that he does not shine by the qualities of instruction. He can neither read nor write.

We shall complete this note by recalling that a tentative similar to that of which Labasse is the hero once found a victim among the market porters. One of them had wagered that he could carry a 350 pound bag of flour to Corbeil. Having got as far as Evry, the Hercules drank a glass of cold water and dropped stone dead. Such useless excesses of muscular fatigue are not unaccompanied with danger.—*La Nature.*

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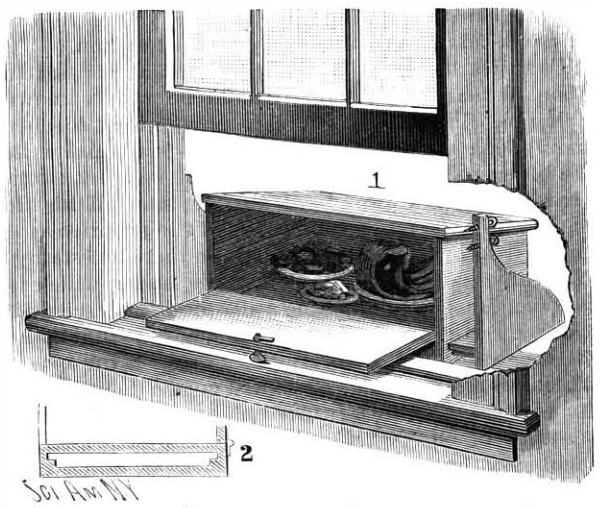
AN INEXPENSIVE WINDOW LARDER.

The illustration represents a box or larder which may be easily fastened in position in windows of varying widths, so that provisions or other contents of the box may be better protected by being kept in a receptacle exposed to the outside temperature. The improvement has been patented by Mr. James Ponisi, of No. 1014 Third Avenue, New York City. The box has a slanting, overhanging cover, and beneath its bottom is a longitudinal slideway, the slides in which have considerable movement outward from the ends of the box, and have at their outer ends curved braces adapted to be secured to the frame of the window. The box is designed to rest on the window sill, and when the slides are adjusted they may be fastened to

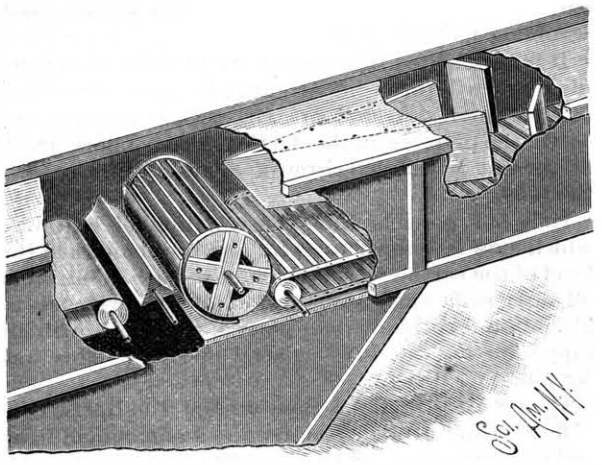


PONISI'S WINDOW LARDER.

the sill by screws or other means. On the inner side of the box is a swinging lid with a suitable catch or lock. The box is preferably made with a false bottom beneath the slides, and, if desired, the top may be of non-conducting material to prevent the heating of the box and its contents by the sun.

A THRASHING MACHINE ATTACHMENT.

The engraving shows a device which receives straw from the thrashing cylinder of a machine, and loosens and fans it in such manner that the chaff will be separated from the straw, permitting the grain to fall down



KEELING'S THRASHING MACHINE ATTACHMENT.

through the straw and rattle rake. It is a patented improvement of Mr. Richard Keeling, of Walhalla, North Dakota. At the rear of the apron or carrier belt of the thrashing cylinder of the machine is a three-cornered picker, back of which is a combined blower and beater driven by a shaft journaled in the casing. Still further back is the rattle rake, above which is a divide board secured to the deck of the casing, and pointing to the central portion of the beater, two deflecting plates, some distance apart, and having a rearward inclination, being placed back of the divide board. As the grain passes up the endless belt from the thrashing cylinder, the straw is loosened and tossed by the picker to the blower and beater, being thrown up by the blades of the latter, while the current of air created by the revolving of the blower blows the chaff from the straw. The divide board separates the air current, and the chaff is carried rearward at each side through the rear outer end of the machine, the straw falling upon the rattle rake being comparatively free from chaff, and the grain being more readily separated therefrom. The current of air is designed to be at all times sufficiently strong to prevent the straw from winding about the beater. The attachment may be applied to any form of thrashing machine.

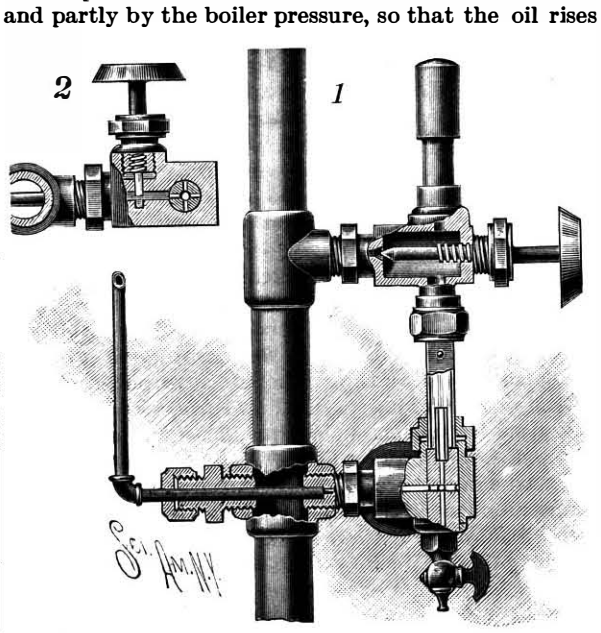
THE AERMOTOR COMPANY, whose fine representation in the windmill exhibit at the Columbian Exposition was mentioned in the SCIENTIFIC AMERICAN of June 3, is located at Twelfth and Rockwell Streets, Chicago, and *not* at Batavia, Ill., as was inadvertently stated.

Recreation for Middle Age.

Mere walking exercise, although it is invaluable, hardly fulfills the idea of perfect recreation. Sir James Paget says "good active recreations" ought to include "uncertainties, wonders and opportunities for the exercise of skill in something different from the regular work." The present writer is always longing for cricket in the summer and football or hockey in the winter and spring. But he cannot find a man anywhere above forty years of age who will agree with him. Why should the literary man, the doctor, and the stockbroker or the merchant not play cricket after forty-five? What is to become of his dinner hour, is it asked? If a better luncheon were taken at midday, and a lighter dinner at six in the evening, there is no reason whatever why a man of forty-five, and up to sixty-five or seventy, should not be in the cricket field at half-past seven and play briskly until nine or half-past. An hour and a half at cricket after a light dinner would make middle-aged men so young that they would not know themselves. Writers would write twice as brilliantly, and business men would be cleverer and keener by half. As it is the average middle-aged Englishman of the professional and business classes grows fatter, wheezier, more pompous, and more dull and uninteresting every year of his life. To get a laugh out of him is impossible; to crack a joke at his expense is to commit the unpardonable sin. "Poor old porpoise," as somebody has called him. His innocent pleasures have vanished with his youth, and "he has nothing now left to live for but his respectability: his solemn respectability, and his money bags." The contrast between the youthful Englishman and his middle-aged parent is sometimes startling. The former is all life and fun: the latter is a moving mountain of ponderosity and fat. It is all for want of outdoor exercise and recreation. Twenty-five years ago the solemn father of to-day was the fun-loving son of a middle-aged father. If anybody had then shown him in a prophetic mirror the figure he would cut at the end of a quarter of a century, he would have committed suicide in sheer vexation and disgust. But all this rotundity, wheeziness, irritability of temper, incapacity for work, and general disgust with life and all things in it can be cured, cured easily, and cured for ever; and the cure for the vast majority of cases is one or two hours' daily exercise and recreation in the open air.—*Hospital.*

AN IMPROVED LUBRICATOR.

The engraving shows a lubricator adapted to properly feed any grade or quality of oil in either an up or down direction. The improvement has been patented by Mr. Henry C. Roller, of New Castle, Del. The oil tank is connected by a pipe with the boiler, so that the oil will be in contact with the steam, and under the influence to some extent of the boiler pressure. The supply pipe from the tank is passed through the steam pipe into which the lubricant is to be discharged, so that the oil may be heated. The supply pipe connects with a casing supported from the steam pipe, as shown in sectional plan view in Fig. 2, and in side elevation in Fig. 1, the casing having a valve controlling the quantity of lubricant entering. The casing also connects with a sight feed tube, and the latter is connected with a second casing discharging into the steam pipe to be lubricated, the quantity of oil and steam to be passed through being regulated by a valve. On the top of the second casing is a steam condensing chamber, the water of condensation from which fills the sight feed tube, while a drip cock at the bottom facilitates cleaning the tube. To feed the oil downwardly the positions of the casings are reversed and the condensing chamber is omitted. As shown in the illustration, the oil from the supply tank is forced into the first casing partly by the displacement due to the condensation of steam and partly by the boiler pressure, so that the oil rises

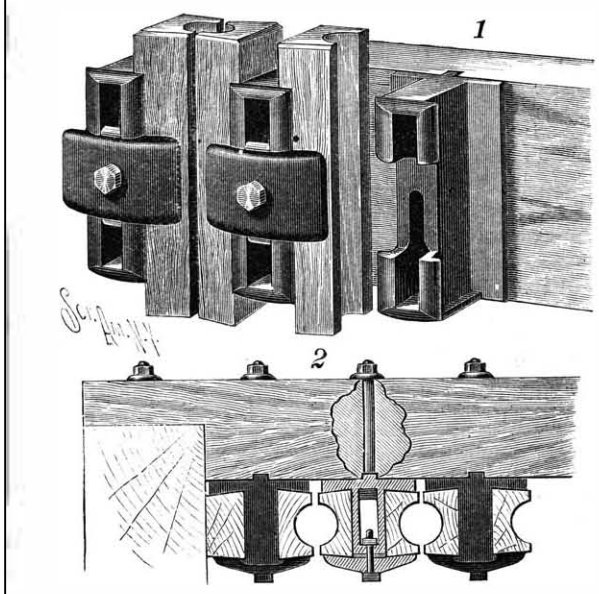


ROLLER'S SIGHT FEED LUBRICATOR.

in drops in the sight feed tube, passing through the second casing into the steam pipe. In feeding downward the oil enters the first casing under boiler pressure, and is forced downward through the sight feed tube, to be finally passed through the second casing into the steam pipe. As the lubricant is under the boiler pressure, any grade of oil can be readily fed, and the casings may be placed sufficient distance apart to provide for any desired length of sight feed tube.

A STAMP MILL GUIDE.

By means of this guide, which has been patented by Mr. Edmund Major, of Terraville, South Dakota, the bearing blocks are securely held in place and can be readily adjusted whenever desired on account of wear or other causes. Fig. 1 shows the application of the improvement, Fig. 2 being a plan view, with parts in section. On the front of the girt or rail, secured by bolts or other means to the battery posts, are formed vertical recesses, into which fit ribs projecting from the backs of keepers secured in place on the girt by bolts. Each keeper is in the shape of an open casing, its back being engaged by the bolts, whose heads extend into the casing. On the rear of each keeper are side flanges with front beveled faces to receive the correspondingly shaped rear side of the bearing block, and on the front of each side of the keeper are short flanges, there being a recess near the middle to be engaged by a flange plate, held in place by a bolt, by screwing up which the bearing blocks are firmly held in position. The sides of the blocks are beveled to correspond to the inclination of the sides of the keepers, so that the blocks are free to slide upward and out of contact with the keeper, or they may be held in fixed position by means of the flange bolt, and when the blocks be-



MAJOR'S GUIDE FOR STAMP MILLS.

come worn by the vertical movement of the stamp stem they may be adjusted by placing a thin piece of wood between the keeper and guide block.

Plug Wheat.

A gentleman who has been down in the Red River Valley tells of a new way the honest farmer has of getting even with the elevator companies. There is considerable of last year's damaged wheat in the locality referred to, which is not salable at the elevators. So the ingenuity of the sons of toil was brought to bear to contrive some way to make them take it. Finally the following plan was devised:

The bottom of a grain sack is filled with good wheat. A length of stove pipe is inserted in the center of the sack and filled with the rejected wheat. The sack is then filled around the stove pipe with good wheat and the pipe withdrawn, and on top of this is put good wheat. In this manner a neat "plug" of rejected wheat seven inches in diameter and two feet in length is inserted in the center of each sack, and is so surrounded by good wheat that it is almost impossible to detect it when dumped into the hopper, especially if the contents of a sack which has not been "plugged" are immediately dumped on top of the contraband wheat. It is said to be a scheme which will circumvent the most eagle-eyed elevator man.—*Valley City (N. D.) Times-Record.*

An Early Plan for an Electric Railway.

The following item is given on page 37 of the *Pictorial Times*, London, of January 17, 1846:

MAGNETIC RAILWAYS.

Experiments of a highly satisfactory nature are being made with regard to the application of electro-magnetism to railway propulsion. The great difficulty to be surmounted is the weight and size of the galvanic batteries requisite for sufficient energy. To obviate this difficulty, it has been proposed to have stationary batteries at regulated distances and to make the rails themselves the conducting lines of the batteries.

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POSITION OF THE PLANETS IN JULY.

JUPITER

is morning star. He has attained once more the supremacy that belongs to him as leader of the planetary brotherhood, and outshines every other star in the heavens in the small hours of the morning. He is a marked feature in the sky on beautiful midsummer mornings, as he pursues his path toward opposition. Jupiter's opposition occurs 34days later every year. It took place last year on October 12. It will take place this year on November 18. The reason is that his synodic period, or the time it takes him to move from opposition to opposition again, is 399 days, an easy number to remember. Meantime, the earth has made one revolution, and advanced 34 days on another, before the sun, the earth, and Jupiter come into line with the earth in the middle. The oppositions of the great planet, therefore, are retarded 34 days each year.

Jupiter rises at the close of the month about midnight, and observers will find him an interesting object from the time he comes looming above the eastern horizon until he is seen no more in the glow of the morning dawn. He is specially attractive as a telescopic study in his present position, a small glass bringing out his brilliant belts and shining moons.

Jupiter's satellites are again in good position for observation. A favorable time to look for them in July is at 2 o'clock in the morning. We give a few of the configurations for an inverting telescope at this hour.

On the 1st, the four satellites are visible, III, II, and I being on the left or west of the planet, and IV being on the right or east.

On the 4th, I is making a transit on the planet's disk, II is on the left, and IV and III are close together on the right, probably looking like a single satellite.

On the 11th, III is occulted by the planet, IV and II are on the left, and I is on the right.

On the 20th, I is making a transit, II, IV, III are on the right.

On the 21st, the four satellites are on the right, IV, III and I closely clustered near the planet and III farther away.

On the 30th, II is occulted, III is on the left, and IV and I near together on the right.

As we watch the manifold changes in these bright orbs, we cannot fail to recall the fifth satellite, the great astronomical discovery of 1892, and the third greatest discovery in the nineteenth century, and to hope that when Jupiter rolls round to his most favorable position again, Barnard with his bright eyes and the aid of the Lick telescope may find a companion for his tiny satellite.

The moon, four days before new moon, is in conjunction with Jupiter on the 9th, at 0 h. 54 m. P. M., being 3° 35′ north.

The right ascension of Jupiter on the 1st is 3 h. 21 m., his declination is 17° 28′ north, his diameter is 33″.4, and he is in the constellation Taurus.

Jupiter rises on the 1st at 1 h. 35 m. A. M. On the 31st he rises at 11 h. 54 m. P. M.

VENUS

is evening star. She has reached a position where she may easily be seen, setting during the month a little more than an hour after the sun. Observers must look for her a half hour after sunset a little south of the sunset point during the first part of the month, and still further south as the month progresses, until at its close she will be found 6° south of the sunset point. Few directions are necessary for finding the peerless star, excepting to learn her position in the sky. She herself reveals the secret of her presence as she glows in the evening twilight, and is beautiful to behold, even when smallest in size and just free from the eclipsing sunbeams.

Venus has an incident to diversify her July course. She makes a close conjunction with Mars on the 9th, at 9 h. 2 m. A. M., being 18′ north. The event would be more interesting if it did not occur in daylight.

The moon is in conjunction with Venus, the day after new moon, on the 14th, at 4 h. 42 m. P. M., being 3° 24′ north.

The right ascension of Venus on the 1st is 7 h. 54 m., her declination is 22° 13′ north, her diameter is 10″.4, and she is in the constellation Gemini.

Venus sets on the 1st at 8 h. 32 m. P. M. On the 31st she sets at 8 h. 20 m. P. M.

MERCURY

is evening star. He reaches his greatest eastern elongation on the 11th at 8 h. A. M., when he is 26° 30′ east of the sun. He is then visible to the naked eye in the west as evening star, but is too far south of the sun to be easily picked up. Southern observers will see him to better advantage.

The moon, two days after her change, is in conjunction with Mercury on the 15th, at 2 h. 15 m. A. M., being 6° 10′ north.

The right ascension of Mercury on the 1st is 8 h. 28 m., his declination is 20° 18′ north, his diameter is 6″.8, and he is in the constellation Cancer.

Mercury sets on the 1st at 8 h. 58 m. P. M. On the 31st he sets at 7 h. 22 m. P. M.

SATURN

is evening star. He ceases to occupy the most prominent place on the records of the month, but there are interesting points in his course. The telescopic view of his rings, belts, and moons is superb, and calls forth much admiration from many observers.

A correspondent of the *English Mechanic* describes the conjunction of Saturn and Gamma Virginis on April 8 as an extremely beautiful sight. The actors in the celestial scene were but 6′ of arc apart, almost touching each other, and visible in the same telescopic field. The contrast between the yellow planet and the brilliant white double star was exquisite. Observers should improve the present opportunity for a telescopic study of the marvelous planet, for his best period of visibility is passing away. It extends from February to July.

The moon, two days before the first quarter, is in conjunction with Saturn on the 18th at 8 h. 36 m. P. M., being 1° 5′ south. The conjunction will be visible, but the resulting occultation will be seen only in the southern hemisphere.

The right ascension of Saturn on the 1st is 12 h. 28 m., his declination is 0° 19′ south, his diameter is 16″.8, and he is in the constellation Virgo.

Saturn sets on the 1st at 11 h. 42 m. P. M. On the 31st he sets at 9 h. 48 m. P. M.

URANUS

is evening star. He is in quadrature with the sun on the 29th at 11 h. 49 m. A. M., being 90° east of the sun. This planet, after retrograding or moving westward since February 18th, becomes stationary on the 14th, and changes his course to direct or eastward motion, continuing to move in this direction until the end of the year. The four giant planets, Jupiter, Saturn, Uranus, and Neptune, are now all moving eastward or in direct motion.

The moon, the day after the first quarter, is in conjunction with Uranus, on the 21st, at 6 h. 4 m. A. M., being 1° 12′ north.

The right ascension of Uranus on the 1st is 14 h. 18 m., his declination is 13° 21′ south, his diameter is 3″.7, and he is in the constellation Virgo.

Uranus sets on the 1st at 0 h. 50 m. A. M. On the 31st he sets at 10 h. 46 m. P. M.

NEPTUNE

is morning star. He is of little importance on the celestial record, for he is very near the sun, and very far from the earth. Several months must elapse before he is in good position for observation.

The moon is in conjunction with Neptune, three days before her change, on the 10th, at 6 h. 33 m. P. M., being 5° 16′ north.

The right ascension of Neptune on the 1st is 4 h. 43 m., his declination is 20° 46′ north, his diameter is 2″.5, and he is in the constellation Taurus.

Neptune rises on the 1st at 2 h. 38 m. A. M. On the 31st he rises at 0 h. 49 m. A. M.

MARS

is evening star. He will be found low down in the west, and during the first part of the month in the vicinity of Venus and Mercury. The close conjunction of Mars and Venus on the morning of the 9th has been described. The planets will be near each other on the evening of that day, and on the evening preceding, and may be seen together in the field of a small telescope, giving an opportunity for comparing their size, color, and brilliancy.

The moon, when one day old, is in conjunction with Mars, on the 14th, at 11 h. 19 m. A. M., being 3° 49′ north.

The right ascension of Mars on the 1st is 8 h. 14 m., his declination is 21° 7′ north, his diameter is 4″.0, and he is in the constellation Cancer.

Mars sets on the 1st at 8 h. 48 m. P. M. On the 31st he sets at 7 h. 46 m. P. M.

THE OCCULTATION OF ANTARES.

The moon occults the star Antares or Alpha Scorpii on the 23d. The immersion takes place at 8 h. 28 m. P. M. The emersion takes place at 9 h. 19 m. P. M., the occultation continuing 51 m. The data are given in Washington mean time, and will vary in other localities on account of the moon's parallax. The moon is then three days past the first quarter and moves with her dark edge foremost. The star will disappear at the dark edge with a startling effect, as if it were suddenly blotted from the sky. Antares is a double star, of the 1.4 magnitude, of a fiery red color. It has a companion of the 7 magnitude of a bright green color, so near the principal as to be nearly involved in its flaming rays. It was not known for a long time if the smaller component shone with complementary or inherent light. The problem was solved in 1856 during an occultation of Antares, when the tiny companion emerged from behind the dark limb of the moon before its overpowering neighbor and gave a curious proof of its independent and not contrasted green color.

The occultation commences more than an hour after sunset. It will be visible and very interesting. The observer as soon as it is dark enough will see the moon approaching the star, and can watch the phenomenon through its whole progress, for when the occultation is over the moon is three hours above the horizon. A small telescope or an opera glass will greatly aid in the observation.

Mercury, Venus, Mars, Saturn and Uranus are evening stars at the close of the month. Jupiter and Neptune are morning stars.

[FOR THE SCIENTIFIC AMERICAN.]

Ethan S. Chapin.

America is the home of self-made men. Thenumber of those who rise from the poorest homes and from most unfavorable surroundings to wealth and eminence is large. Comparatively few, however, become distinguished as scholars, unless while young they receive the advantages of a fairly good education.

Four years ago last March there died at Springfield, Mass., a man whose name should be widely known, Ethan S. Chapin, Esq. While a boy he went to school barely long enough to learn how to read and write. He began to support himself when he was but twelve years of age, and was a hard-working man all his life. Many will remember him as one of the proprietors of the well known Massasoit House in its palmiest days. Notwithstanding the disadvantages under which he labored, Mr. Chapin became a distinguished scientific scholar. He published several books; the latest, "Gravitation the Determining Force," is the one on which his reputation as a scientist must chiefly depend. As early as 1867, he advanced the theory of "The Instability of the Earth's Axis," a theory which no scholar of importance had ever taught, and which, when proposed by Mr. Chapin, was treated with contempt. Latterly, however, it has received increasing attention, and is now generally accepted by students of physical science. It has long been noticed that the geographical position of the observatories on the continent of Europe changed each year. They have been slowly receding from the North Pole. Various suggestions have been made to account for this phenomenon. There seems to be no alternative but to admit that this variation of latitude is caused by a movement of the poles. In other words, the geographical axis of the earth is not identical with its axis of rotation. The pole of the former is about fifteen miles distant from that of the latter. The geographical pole actually moves about four feet every year.

In consequence of this unsteadiness of its axis, the earth, as it moves along its orbit, has an eccentric, wabbling motion.

It is anticipated that further study in the line of this discovery will throw important light upon three facts of great interest to students, viz., the glaciation of the earth, the presence in the Arctic regions of flora which at present is characteristic of Southern Europe, and the tides.

Is it not possible that the variation of latitudes, which now is known to exist, and the changes in the level of the earth's crust, which have been going on in all ages, sufficiently account for all the evidences of glaciation found in various parts of the world, without supposing an extensive "glacial epoch"? This was Mr. Chapin's belief.

The presence in the regions around the North Pole of flowers and fruits which require an amount of light and heat now found in the southern part of the north temperate zone leads us to suppose either that the earth formerly received far more heat from the sun than it now does or that the position of those northern latitudes has very perceptibly changed. This latter hypothesis has been made more probable by the discovery of the instability of the earth's axis.

The eccentric motion of the earth caused by this instability of its axis is of great importance in explaining the phenomenon of the tides. In no other way can we so easily account for the accumulation of the tidal waves on opposite sides of the earth, and for their tardy movement following the track of the moon. It is very interesting to know that it was the study of this subject that led Mr. Chapin in the first place to discover the now generally accepted and important phenomenon of the instability of the earth's axis.

Fast Traveling.

The train which the Pennsylvania Railroad furnished for carrying the naval officials to Chicago on their recent visit to the World's Fair, the *Railway Master Mechanic* says, astonished most of those Europeans who participated in the journey, by its elegance and many conveniences. The train consisted of eight Pullman cars, which, with the engine, weighed over 500 tons. But notwithstanding the heavy train, the time from Chicago to Jersey City was made in less time than the "Limited." The distance from West Philadelphia to Jersey City, 92 miles, was covered in 102 minutes, and 18 miles between New Brunswick and Elizabeth were covered in 14 minutes, which is believed to be the fastest ever run with such a heavy train. From Pittsburg to Altoona two engines were employed to haul the train, but all the rest of the trip was made with the class "P" engine.

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World's Fair Notes.

(*Continued from page 3.*)

think it advisable to skip this thoroughly delightful part of the Exposition. There is more real harmless amusement and instruction for the average person to be had in the Plaisance for $5 than can be obtained for three times the money elsewhere. It is something to hear the orchestras of all nations, which run in a direct line from the German band down to the Chinese artists, who will certainly be lynched when the cowboys come.

The Russian pavilion was opened with all the pomp and ceremony incident to the practice of the rites of the Greek Church. His Eminence the Most Reverend Nicholas, Bishop of the Russian Greek Church of America, was the celebrant of high mass, and after an address the bishop dipped the gold crucifix in holy water and sprinkled the temporary sanctuary, and then, amid the eager gaze of thousands of spectators and the chiming of bells, he sprinkled each of the exhibits with holy water. The party then returned to the temporary church, and all present were sprinkled with the water and allowed to kiss the crucifix.

One of the engineering successes of the Fair is the transmission of power by compressed air. From the huge compressors in Machinery Hall the air is carried to the Transportation building, in a nine-inch pipe, at a pressure of eighty pounds to the inch. The stately Baldwin locomotives and other exhibits are run by the air thus delivered. In the Mines building live steam is provided, which runs a compressor, which in turn furnishes the power for nearly all the machinery in the building. One peculiarity which was noticed particularly when the locomotives were started was that all the stuffing boxes leaked, until repacked. The gain in comfort is remarkable, as the Transportation building would be insufferably hot, if the machinery were to be run by steam. As it is, the exhaust air assists ventilation. Compressed air is also used in the sewage system of the grounds.

The legislature of Illinois has passed a bill enabling the Park Commissioners to purchase the Art Gallery building at the close of the Exposition. It is noted as being one of the purest and most beautiful architectural designs in the world.

Correspondence.

Square Shafting Made of Sheet Steel.

To the Editor of the Scientific American:

Your illustration of the broken shaft of steamship Hecla in your issue of June 3 shows clearly the inconsistency of one solid shaft forging. Had the same consistency of iron been secured together in sheets of steel say one-half to one inch thick, the shaft made square, bolted or clamped together to prevent either twisting or buckling, with the bearings collared on the square, I will venture to assert the practical engineer will agree with me in saying the steel plates composing a shaft as suggested will be naturally stronger than a single forged body of iron. I claim also a square shaft when broken is more readily mended by clamps and bolts than the round shaft now in common use. My reasoning for this is the same in building a timber of several boards from different lumber when secured properly together is much stronger than one solid timber. G. W. K.

New York, June 8, 1893.

A Simple Method for Determining the Velocity of Projectiles.

To the Editor of the Scientific American:

It may be of interest to amateur riflemen to know the following simple method for ascertaining the effect of gravity on a bullet shot horizontally from a rifle to any distance:

Sight the rifle upon the target, keeping the sights plumb above the center line of the bore of the rifle. Mark where the ball strikes. Then reverse the rifle, so as to have the sights exactly *beneath* the line of bore. In this reversed position sight it on the target as before, and mark where the bullet strikes. One-half the difference in the elevation of the two bullet marks will represent the effect of gravity in drawing the bullet away from a straight line.

Divide the difference in elevation of the two bullet marks by 32 and extract the square root. This will give the time in seconds that it took the ball to travel the distance.

The distance divided by this time will give the speed of the bullet per second. J. A. G.

Grand Rapids, Mich.

The Litchfield Mill.

To the Editor of the Scientific American:

In your issue of June 10, I notice a communication from Mr. E. L. Otis, of Minneapolis, who good naturedly brings you to task for referring to the great mill which exploded in this city, March 21, as probably the largest flour mill in the world. Mr. Otis exhibits true loyalty to his own city, and grows indignant at the thought that outside of his famed flour-milling city of Minneapolis could exist the largest mill in the world. If the SCIENTIFIC AMERICAN had qualified its assertion by adding "winter wheat," no objection to the statement could possibly be sustained, for the Litchfield mill was, so far as we know, the largest *winter wheat* flour mill in the world, having a capacity of 2,000 barrels of flour a day. The product of this mill was all sold in Europe, not a pound being put upon the market in this hemisphere.

A scientific explanation of this most disastrous, and at the same time most wonderful, explosion would not only interest Litchfield people, but your readers in general throughout the country.

HARRY E. KELLY,
Editor Herald, Litchfield, Ill.

The White Pine Aphis.

To the Editor of the Scientific American:

I send you by to-day's mail some specimens of a bug or beetle that is destroying the pine trees in this county, and any information that you may give, either by mail or through your valuable paper, will be appreciated by this community. You will perceive two small horns or teats on their backs that the common red ants nurse from. This I watched for an hour this morning. Would like a remedy for destroying them without injury to trees. By request of several citizens.

GEORGE A. MILES.

Ainsworth, Neb., June 6, 1893.

Reply by Professor C. V. Riley.—The specimens referred to by Mr. Miles were in extremely bad condition when received, but from the partially decayed remnants it is evident that they were a large species of plant louse belonging to the genus Lachnus and closely related to, if not identical with, *L. strobi*, Fitch, the condition of the specimens not permitting positive specific determination. This insect is known as the white pine aphis, and is the commonest species of its family upon that tree in the Atlantic States. The lice congregate in colonies on the ends of the pine twigs, the bark of which they puncture. They are almost always accompanied by ants, which are attracted by the honey dew which the plant lice secrete from the little honey tubes referred to by Mr. Miles. The species has been observed in the past to be extremely abundant in certain years and comparatively rare in others. This alternation in the relative numbers of the Lachnus has been found to be due to the rapid increase of its natural enemies whenever the conditions favor and to the succeeding necessary decrease of the Lachnus itself. Later in the season a great many, if not the large majority, of the plant lice will be found dead, the dried remains clinging to the leaves and branches, and upon close inspection these dead bodies will be found to have a minute hole, from which a hymenopterous parasite has issued. Ladybirds, lace-wing flies, and syrphus flies are all active in preying upon them.

It is difficult to deal with any insect trouble of this kind upon large trees over extensive forests, but individual trees may be sprayed with ordinary kerosene soap emulsion diluted with from five to ten parts of water, and such spraying will undoubtedly have a good effect in destroying the bulk of the plant lice. Otherwise it is pretty safe to trust to the natural enemies which I have mentioned, and which will, in the course of the summer, effectually do their work. An interesting note has been published in one of the earlier numbers of *Insect Life* (Vol. II., No. 10, p. 314) upon the subject of the honey secreted by one of these pine-inhabiting species of Lachnus. I have sent Mr. Miles a marked copy of this bulletin for his information.

It is quite possible that some other agent is at work in the destruction of the pine timber referred to by Mr. Miles and that the Lachnus is only an incident. It would be well for him to have the trunks thoroughly examined for bark borers. Their presence may be known by the exuding pitch and by their exit holes, like shot holes, in the bark. Just now, also, another plant louse, *Chermes pinicorticis*, is proving very destructive to pines, especially white pines, in parts of Nebraska, and this is really more disastrous than the Lachnus. It is a smaller insect and attaches itself in more sheltered portions of the twigs and branches, covering itself with a flocculent material. There has been no experience on a large scale as to the best methods of ridding trees of either of these insects, so that the recommendation to use kerosene emulsion is from analogy as to its action on allied forms.

Nitro-glycerine Precautions.

To the Editor of the Scientific American:

In your issue of February 4, 1893, I note a communication from Mr. J. T. Pettee, of Meriden, Conn., on the subject of keeping nitro-glycerine and dynamite from freezing, thereby avoiding some of the terrible calamities frequently reported, where workmen are killed by an explosion which ensues consequent upon their thawing these substances out.

While, theoretically, Mr. Pettee is right in saying that nitro-glycerine and dynamite should be kept from freezing, the practical application would not, in many cases, work to a successful end. If the men who use these explosives cannot thaw them out properly, it cannot be expected that they will exercise anymore intelligence in keeping them unfrozen. But it is already an incontrovertible fact that it is extremely dangerous to transport nitro-glycerine in an unfrozen state.

Therefore, the proper point to aim at is to insist that, if frozen, it must be *thawed out properly*. Upon this point, the laws should be most stringent, and the responsibility for non-compliance should be placed, not upon the ignorant workman, who is only a machine, but upon *those who have the work in charge*.

Apropos of the subject under discussion, I will quote below from an able series of lectures by Prof. Charles E. Munroe, of the Columbian University, Washington, D. C., formerly chemist to the Torpedo Corps, United States Navy, whose practical experience and experimentation with and analysis of every known form of explosive for a period of over twenty years make him the best authority in matters of this kind:

"When frozen, nitro-glycerine may be conveniently and safely thawed by placing the vessel containing it inside another containing water not hotter than 100° Fah., but these precautions should be strictly observed, as most of the accidents which have occurred with nitro-glycerine and explosives of which it forms a part have resulted from foolish and criminally careless attempts to thaw the frozen material by other means. Frozen explosives should never be put into the vessel containing the water, or brought into contact with any heated surface, except as directed above. Nitro-glycerine and its dynamites are extremely tricky when pure and when fresh, and if kept at normal temperatures they are not liable to undergo decomposition; but when subjected to the extreme heat of summer, followed by the excessive cold of winter, for a number of years, they are very apt to become unstable, hence dangerous, unless handled and used with extreme care.

"Many foolish persons suppose that since it is reasonably safe to ignite a cartridge of unfrozen dynamite, it is equally safe to warm it upon a shovel, or in an oven, or in a tin vessel over a fire, or in various other ways, which usually lead to a verdict of *accidental death*, but would be more properly designated as *suicide* or *manslaughter*. It cannot be too strongly impressed upon the minds of those handling them that if dynamite or other nitro-glycerine preparations are gradually warmed up to a temperature approaching their exploding points, they become extremely sensitive to the least shock or blow, and once that point is reached they do not simply ignite, but they explode with great violence; and further, that owing to the poor conductivity of the mass, a portion of it which is in contact with the source of heat may become raised to this temperature, while the rest of the mass is much below it."

The proper way to prevent the loss of life occasioned by this careless way of thawing out nitro glycerine and dynamite would be, it seems to me, to embody the subject matter above in a set of formulated rules receiving the sanction and pressure of the law in each and every State, whereby the verdicts of *accidental death* would be changed to their proper signification, *suicide* or *manslaughter*—suicide where an individual is concerned, manslaughter where a corporation is responsible. SAMUEL RODMAN, JR.,
Late 1st Lieut., U. S. Army.

Chicago, Ill., June 1, 1893.

The American Association for the Advancement of Science.

The forty-second annual meeting of the American Association for the Advancement of Science is to be held in Madison, Wis., from August 16 to August 23, inclusive. By the courtesy of the Regents the sessions will be held in the buildings of the University of Wisconsin and in the assembly chamber of the capitol. Lanterns for projecting views and slides are provided in several rooms, and one room is kept for general lantern use. To it any section may adjourn when lantern facilities are required. The outline of the programme has been published and indicates a full employment of the time of the meeting. F. W. Putnam, Cambridge (office Salem), Mass., is the permanent secretary.

Paint for Iron and Steel.

The invention refers to a new material, called "siderosthen," for the coating of iron and steel surfaces, with a view to prevent the formation of rust upon them. The compounds used for the manufacture of this paint are the tar obtained from works producing fat gas, "goudron," which is a mixture of about 85 part of refined Trinidad asphalt and 15 parts of refined asphalt oil, or, instead of the "goudron," sulpburmay be used. If "goudron" be employed, this is dissolved in the gas tar, in suitable quantities, and this mixture can then forthwith be employed for the purpose in view. If sulphur be used, 8 per cent of it is mixed with the gas tar, and this mixture is then heated to about 100° C.

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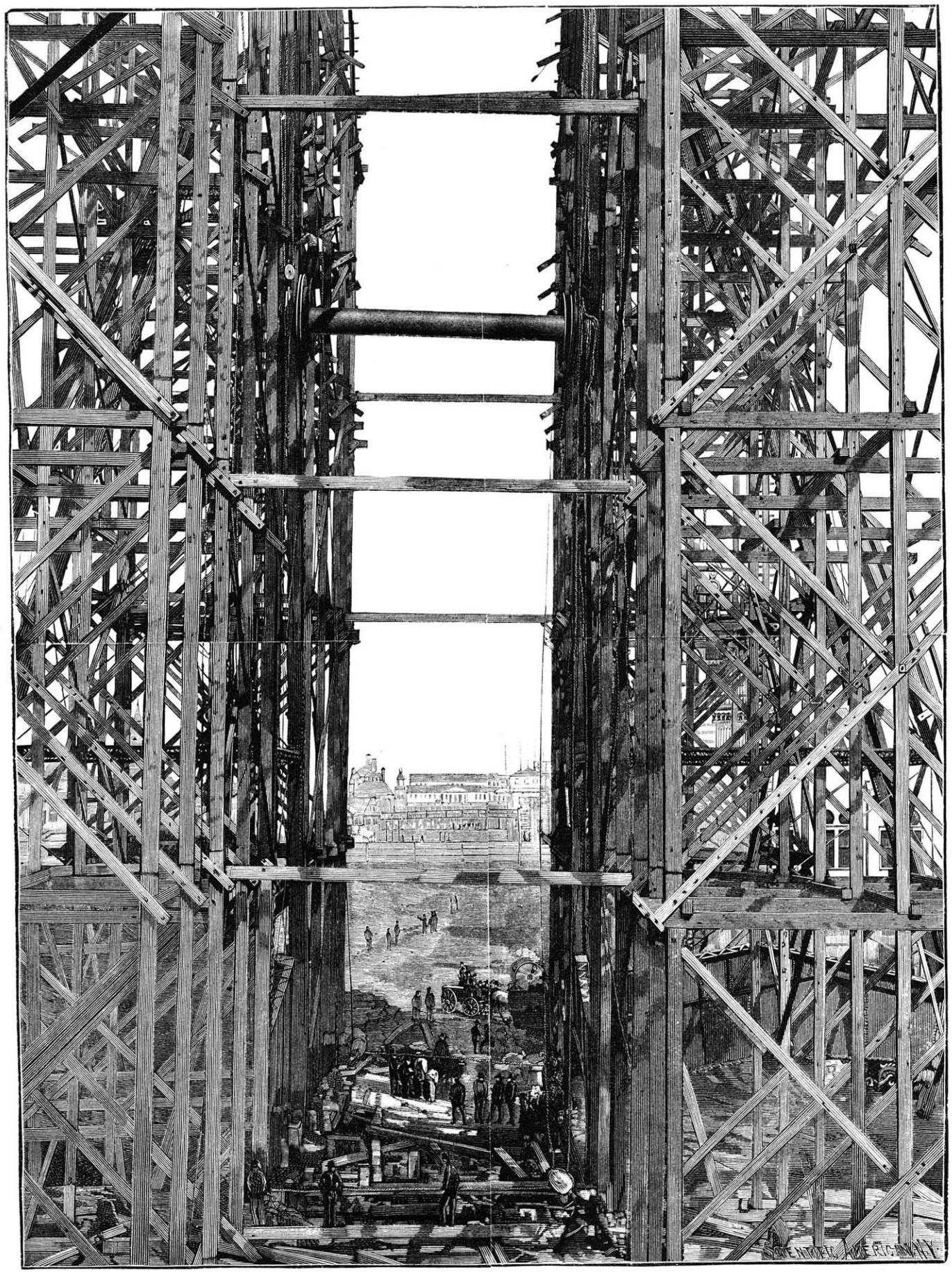
THE GREAT WHEEL AT CHICAGO.

The wonderful "merry-go-round" designed by Engineer George W. G. Ferris, of Pittsburg, Pa., is now completed and forms a most remarkable and attractive object. This curious piece of mechanism carries thirty-six pendulum cars, each seating forty passengers; thus one revolution of the wheel carries 1,440 people to a height of 250 feet in the air, giving to each passenger a magnificent view and a sensation of elevation akin to that of a balloon ascent. The practical working of the great machine is attended with perfect success, and its construction and operation reflect the highest credit on the author.

The description of the construction of the great wheel given in the Chicago *Tribune* will be of interest, and we make the following abstract:



THE WORLD'S COLUMBIAN EXPOSITION—SCAFFOLDING EMPLOYED IN THE ERECTION OF THE GREAT FERRIS WHEEL.

The wheel is composed of two wheels of the same size, connected and held together with rods and struts, which, however, do not approach closer than twenty feet to the periphery. Each wheel has for its outline a curved, hollow, square iron beam, 25½ × 19 inches. At a distance of 40 feet within this circle is another circle of a lighter beam. These beams are called crowns, and are connected and held together by an elaborate trusswork. Within this smaller circle there are no beams, and at a distance there appear to be nothing. But at the center of the great wheel is an immense iron axle, 32 inches thick and 45 feet in length. Each of the twin wheels, where the axle passes through it, is provided with a large iron hub, 16 feet in diameter. Between these hubs and the inner "crowns" there are no connections except spoke rods, 2½ inches in diameter, arranged in pairs, 13 feet apart at the crown connection. At a distance they look like mere spider webs, and the wheel seems to be dangerously devoid of substantial support.

The explanation of this is that the Ferris wheel—at least inside the smaller crowns—is constituted on the principle of a bicycle wheel. The lower half is suspended from the axle by the spoke rods running downward, and the upper half of the wheel is supported by the lower half. All the spoke rods running from the axle north, when it is in any given position, might be removed, and the wheel would be as solid as it would be with them. The only difference is that the Ferris wheel hangs by its axle, while a bicycle wheel rests on the ground, and the weight is applied downward on the axle.

The thirty-six carriages of the great wheel are hung on its periphery at equal intervals. Each car is twenty-seven feet long, thirteen feet wide, and nine feet high. It has a heavy frame of iron, but is covered externally with wood. It has a door and five broad plate glass windows on each side. It contains forty revolving chairs, made of wire and screwed to the floor. It weighs thirteen tons, and with its forty passengers will weigh three tons more. It is suspended from the periphery of the wheel by an iron axle six and one-half inches in diameter, which runs through the roof. It is provided with a conductor to open the doors, preserve order, and give information. To avoid accidents from panics and to prevent insane people from jumping out, the windows will be covered with an iron grating.

It is being considered whether each car shall not have a telephone connection with the office on the ground. It is thought that this would be an attraction, both as a sort of amusement for people who wished to converse with their friends below or in another car and as a sort of reassurance to timid people. The thought of being detained up in the clouds, as it were, by accident, and not being able to learn what it is or when it will be remedied, might frighten some timid people out of making the trip. It is not very difficult, however, to climb by the wheel itself to any car, and there will always be men on the ground who can do this.

The wheel, with its cars and passengers, weighs about 1,200 tons, and therefore needs something substantial to hold it up. Its axis is supported, therefore, on two skeleton iron towers, pyramidal in form, one at each end of it. They are 40×50 feet at the bottom and 6 feet square at top, and about 140 feet high, the side next to the wheel being perpendicular, and the other sides slanting. Each tower has four great feet, and each foot rests on an underground concrete foundation 20×20×20 feet. Cross bars of steel are laid at the bottom of the concrete, and the feet of the tower are connected with and bolted to them with iron rods.

One would naturally suppose that there would be great danger of making such a huge wheel as this lopsided or untrue, so that it would not revolve uniformly. Even if the wheel itself were perfectly true, it would seem that the unequal distribution of passengers might make it eccentric in its speed. But according to L. V. Rice, the superintendent of construction, there is absolutely no danger of this kind. Not only did the wheel alone turn uniformly, but when the cars were hung, one after another, no inequality was observed. As to passengers, Mr. Rice says that the 1,400 passengers will have no more effect on the movements of the speed than if they were so many flies.

The wheel, however, is never left to itself, but is always directly and constantly controlled by a steam engine. The wheel points east and west, and the one thousand horse power reversible engine which runs it is located under the east half of it and sunk four feet in the ground. The machinery is very similar to that used in the power houses of the cable car companies, and runs with the same hoarse roar that they do. It operates a north-and-south iron shaft 12 inches in diameter, with great cog wheels at each end, by means of which the power is applied at each side of the wheel.

The periphery of both of the great outer crowns of the great wheel is cogged, the cogs being about six inches deep and about eighteen inches apart; and the power of the engine is applied at the bottom of the wheel. Underneath the wheel, in line with the crown on each side, are two sprocket wheels nine feet in diameter, with their centers sixteen feet apart. They are connected by an immense endless driving chain, which plays on their own cogs and on the cogs of the great wheel as well. These sprocket wheels are operated by the engine at the will of the engineer, who can turn the wheel either way, and fast or slowly, as he may wish. The wheel is 250 feet in diameter, 825 feet in circumference, and 30 feet wide, and is elevated 15 feet above the ground.

The great wheel is also provided with brakes. Near the north and south ends of the main shaft are two ten-feet wheels, with smooth faces, and girdled with steel bands. These bands terminate a little to one side in a large Westinghouse air brake. If therefore anything should break, and the engine fail to work, the air can be turned into the air brake, and the steel band tightened until not a wheel in the whole machine can turn. In the construction of this great wheel every

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conceivable danger has been calculated and provided for. Windage was a matter of the greatest importance, for, although the wheel itself is all open work, the cars present an immense resisting surface. But Mr. Rice points to the two towers, with their bases fifty feet north and south of the wheel, and bolted into twenty feet of concrete, and says that a gale of 100 miles an hour would have no effect. He says that all the frost and snow that could adhere to the wheel in winter would not affect it; and that if struck by lightning it would absorb and dissipate the thunderbolt so that it would not be felt.

It is arranged to empty and refill six cars with passengers at a time, so that there will be six stops in every revolution. Accordingly six railed platforms, of varying heights, have been provided on the north side of the wheel, and six more, corresponding with these, on the south side of it. When the wheel stops, each of the six lowest cars will have a platform at each of its doors. The passengers will step out of the south doors and other passengers will step in at the north doors. Then the next six cars will be served the same way, and the next and the next all day, and perhaps all night. It is expected that the wheel will revolve only once in every twenty minutes. Passengers will remain on board during two revolutions and pay fifty cents for their fun.

The Ferris Wheel Co. was capitalized at $600,000, and $300,000 worth of bonds were issued and sold. The final concession for the erection of the wheel was not granted until December, and all the work has been contracted for and done since then, the iron having been in the pig in January, while the scaffolding was not begun until March 20. By the terms of the concession, the company pays to the Exposition one-half of all its receipts after they have amounted to the cost of the wheel. On the day the wheel was first started, June 21, 5,000 guests were present at the inaugural ceremonies, all of whom were given a ride on the great wheel. The motion of the machinery is said to have been almost imperceptible.

THE GREAT FERRIS WHEEL AT CHICAGO—ATTACHING THE CARS.

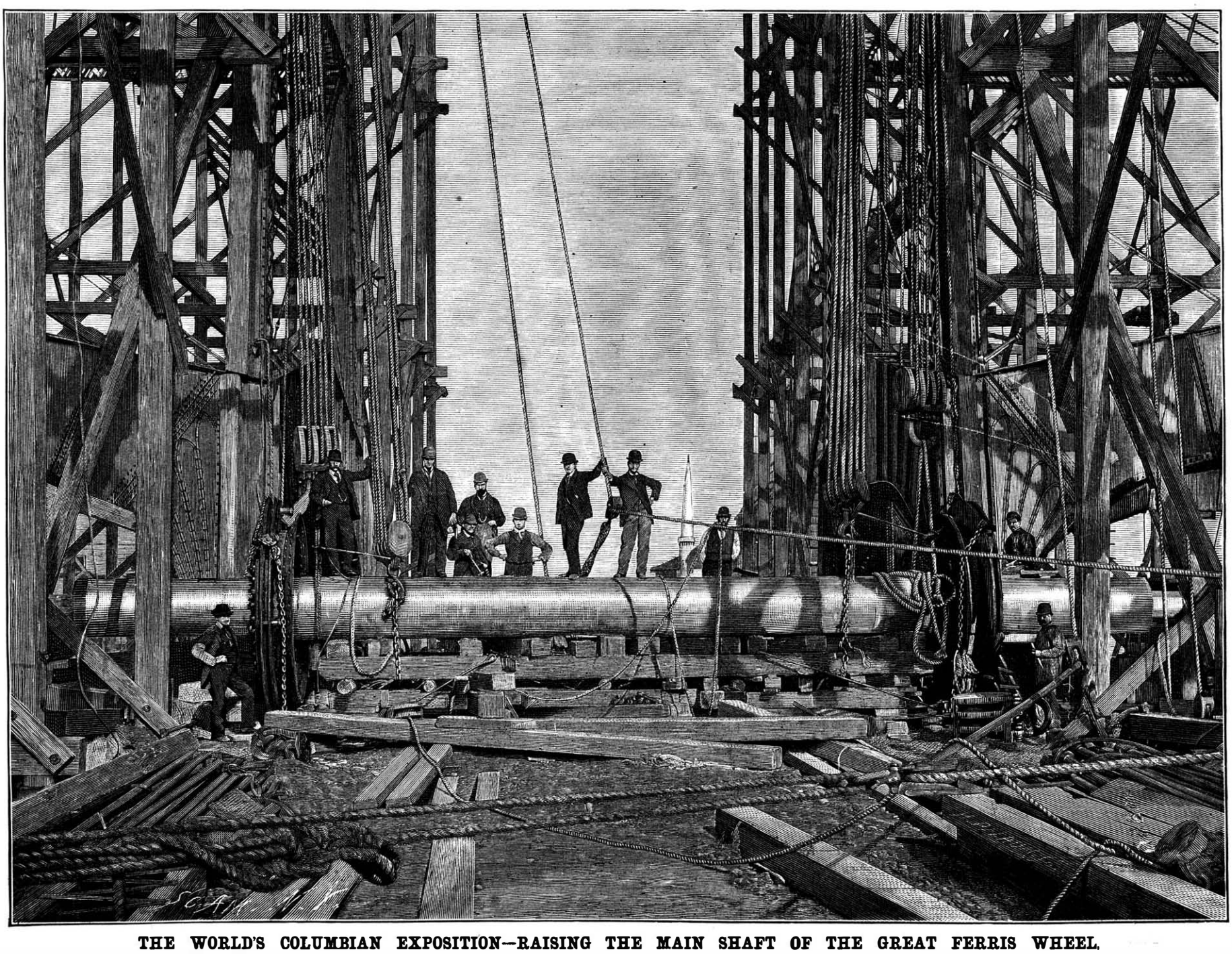
Tar and Asphalt for Tanks.

A mixture of coal tar and Californian rock asphaltum has been successfully employed by Mr. R. C. Gemmell for lining a reservoir for the city water works of La Grande, Oregon. The reservoir is of oval shape, part in excavation in heavy clayey soil and part in embankment made from the excavated material, with inner slopes of three to one. The depth of water is ten feet; the area of surface, 20,880 square feet; and the capacity, 1,000,000 gallons. The lining consists of one layer of brick on edge, covered by three-eighths inch of the bitumen mixture. After the earth had been excavated and the embankment made, the whole surface was thoroughly rammed with iron punners weighing twenty-five pounds each. The bricks were then laid, and rammed solidly into place; the joints and cracks being brushed full of clean sand. Coal tar was used as a flux for the asphalt, in the proportion of from ten to twelve per cent by weight of the latter; the mixture being "cooked" by boiling for five or six hours with constant stirring. A large bucketful at a time was taken out of the kettle by two men, and spread in a thin layer over the bricks by means of shovel and broom. It required two layers put on in this way to make the requisite thickness of three-eighths inch. As much sand as would adhere to it was sprinkled over the last layer while hot. The reservoir has never leaked. It is suggested that this way of rendering tanks water tight at small expense might be extensively used for sewage works, etc.

A Unique Musical Bedstead.

A Bombay man has constructed a bedstead priced at 10,000 rupees, and *The Ironmonger* appends the description as follows: "It has at its four corners four full-sized gaudily-dressed Grecian damsels, those at the head holding banjos, while those on the right and left foot hold fans.

Beneath the cot is a musical box, which extends the whole length of the cot, and is capable of playing twelve different charming airs. The music begins the moment the least pressure has been brought to bear from the top, which is created by one sleeping or sitting, and ceases the moment the individual rises. While the music is in progress the lady banjoists at the head manipulate the strings with their fingers and move their heads, while the two Grecian damsels at the bottom fan the sleeper to sleep. There is a button at the foot of the cot which, after a little pressure, brings about a cessation of the music, if such be the desire of the occupant."



THE WORLD'S COLUMBIAN EXPOSITION—RAISING THE MAIN SHAFT OF THE GREAT FERRIS WHEEL.

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Natural History Notes.

Fecundity of Some of the Sea Fishes.—In the "Annual Report of the Fishery Board of Scotland," Mr. Wemyss Fulton states that more than a hundred examples have been observed that go to show the great fecundity of sea fishes. The number of the eggs of thirty-nine species has already been estimated. This number varies considerably, according to the size and age of the individual. Of all the fishes, the ling (*Molva vulgaris*) produces the greatest number of eggs, say from twenty to thirty million.

The gurnard (*Trigla lyra*) produces but a few hundred, that are taken care of by the male, which places them in a pocket situated near his abdomen.

The cod (*Morrhua vulgaris*) produces all the way from two to eight million eggs; the haddock (*Gadus æglefinus*) about two or three hundred thousand, and even a million; and the coal fish (*Gadus virens*) from four to eight million. In the herring (*Clupea harengus*) the number amounts to from twenty to fifty thousand. Out of sixteen specimens examined, the mean exceeded thirty thousand. Hitherto such fecundity as this has not been admitted for this fish.

The turbot (*Rhombus maximus*) also is very fecund. It produces from three to ten million eggs.

Less productive is the dab (*Pleuronectes limanda*), which produces from thirty to sixty thousand eggs.

Proportionally to its size, the plaice (*Pleuronectes flesus*) produces more than all others, the number of its eggs being five hundred thousand or a million and a half.

The sole (*Solea vulgaris*) is very productive, but, as with a large number of other species, the quantity of its eggs has not yet been estimated.

The Silk of Spiders.—In the *Revue des Sciences Naturelles Appliquées* for March, 1892, there is a paper by Rev. P. Camboue on the silk of spiders. After giving a history of the attempts to obtain and use the silk of spiders, he gives some interesting experiments of his own, made on a large orb-weaving spider of Madagascar (*Nephila madagascariensis*, Vinson). He finds that the spider furnishes the most silk after she has laid her eggs. From one spider there was obtained in twenty-seven days nearly four thousand meters of silk. The silk was of a golden yellow color. He gives the plan of an apparatus for winding the silk, which, however, as he says, is imperfect. Nothing, however, was done as to the raising and keeping of the spiders in large numbers, undoubtedly the most serious question. —*Insect Life.*

A Fish-Eating Rodent.—A very interesting new mammal has recently been received at the British Museum in the form of a fish-eating rat from the mountain streams of Central Peru. The animal is of about the size of a common house rat, but has a flattened head, strong and numerous whisker bristles, and very small eyes and ears, characters which give it a striking resemblance in its physiognomy to some of the aquatic genera of the Insectivora and Carnivora, such as *Potamogale*, *Myogale*, *Lutra*, or *Cynogale*. Its swimming powers are evidently very great, as is shown, among other things, by its broad, webbed and strongly ciliated hind feet, far better developed for this purpose than are those of the ordinary swimming Muridæ, such as the English water vole, whose simple vegetarian diet does not necessitate the development of any exceptional swimming powers. In color, like the common water shrew, it has a dark upper side with a whitish belly, and has a markedly bicolor black and white tail.

The chief interest of the new form centers in the fact of its being wholly a fish-eater, and in its having in connection therewith its incisor teeth modified for catching a slippery, active prey by the development of their outer corners into long sharp points, and its intestines altered by the reduction almost to *nil* of its cæcum, an organ in vegetarian Muridæ always of great size and capacity. The stomach of the single specimen obtained contains fish scales, recognized by Mr. Boulenger as those of *Tetragonopterus alosa*, a fish whose average length is about six inches.

This animal represents quite a new departure in rodent life history, for although it is now perfectly well known that the North American musquash (*Fiber zibethicus*) occasionally feeds on fish caught by itself, yet there is no other rodent which, as in the case of *Ichthyomys stolzmanni*, as it is proposed to term the new form, wholly lives on fish, to the exclusion of a vegetable diet.

Variation in Species of Plants.—Dr. E. Sickenberger, professor of chemistry, botany, and materia medica at Cairo, in a letter to a correspondent, states that he has several times had the opportunity of substantiating the facts that, in Egypt, seeds of *Gignut* (?), a variety of *Cannabis sativa* from Europe, produce the true *C. sativa* yarn by the third generation; the black mustard, *Brassica nigra*, is transformed in the second generation into the endemic *B. bracteolata*, Fisch. et Mey; and the thick-rooted celery assumes in the first year the much foliated form with a thin root stock, like the summer spontaneous form in Egypt.

Local Names of Common Insects.—Several times in the columns of this journal, says *Insect Life*, we have solicited correspondence with regard to local names for our commoner insects, and a number of our correspondents have responded.

The most interesting information on this head has lately come to us from Mr. Alvah A. Eaton, who sends quite a list of names current between Newburyport, Mass., and Portsmouth, N. H. Some of them are entirely new, and are probably quite local. The walking stick (*Diapheromera*) is there known as "scorpion." The term "huckleberry bug" is used indiscriminately for a species of red mite and for soldier bugs, just as "red bug" is applied in the South to mites and the cotton stainer. May beetles and the like are called dor bugs, an old English name for this class of Scarabæids. "Crackamire" and "needle ichneumon" are the names given the long, slender ichneumon flies. The large Locustidæ, or long-horn grasshoppers, are very appropriately called "cradlers," from the resemblauce of the ovipositor of the female to a grain cradle; but most singular of all is the application of the name of locust to the large Bombycid moths, such as the *Cecropia*, *Luna*, and *Polyphemus*, and of lady-bird for the Sesiid or humming bird moths.

A New York correspondent writes that the carpet beetle, *Anthrenus scrophulariæ*, universally but incorrectly called "buffalo moth," is known in certain towns along the Hudson as "Russian months."

The different names that have been proposed for the *Acanthia lectularia*, the insect which "has no wings at all," but which makes its presence felt notwithstanding, will fill several pages. Around Boston these torments are called "chintzes" and "chinches," and from Baltimore we get the name "mahogany flats," but in New York they speak of them as "red coats."

Ant Communities.—Sir John Lubbock, in a recent lecture on the "Habits of Ants," said that the question naturally arose whether ants were moral and accountable beings. They had their desires, their passions—even their caprices. The young were absolutely helpless. Their communities were sometimes so numerous that, perhaps, London and Pekin were almost the only cities which could compare with them. Moreover, their nests were no mere collections of independent individuals, nor even temporary associations, like the flocks of migratory birds, but organized communities, laboring with the utmost harmony for the common good. The remarkable analogies which to our human societies they presented in so many ways rendered them peculiarly interesting to us, and one could not but long to know more of their character, how the world appeared to them, and to what extent they were conscious and reasonable beings. Various observers had recorded, in the case of ants, instances of attachment and affection. He had never, in the whole course of his observations, noticed a quarrel between two ants belonging to the same nest. Within the limits of the community all was harmony. On the other hand, it must be confessed that ants not belonging to the same nest were always enemies, even if belonging to the same species. Sir John went on to give details of a number of interesting experiments and observations, which, he contended, might be held to prove the possession by the ant of an almost human intelligence. One result which he deduced was, that even in the largest nests the ants all recognized their companions. He had invariably found that if a strange ant, even of the same species, was introduced into a nest, she was sure to be attacked and driven out. He had also made some experiments on the power possessed by ants of remembering their friends, and he found that after a year's separation they did so.

The Natural Enemy of the Spider.—The ichneumon fly of Ceylon is the natural enemy of the spider. The insect is green in color, and in form resembles a wasp with a marvelously thin waist. It makes its nest of well-worked clay, and then goes out on a hunting expedition. Its victims are invariably spiders of various kinds, but all are subject to the same mode of treatment. A scientific sting injects some poison which effectually paralyzes the luckless spider, which is then carried off to the nest and there fastened with a dab of moist clay.

Another and another victim is brought to his chamber of horrors. Then the prescient mother ichneumon fly proceeds to deposit her eggs, one in the body of each spider, which can just move its legs in a vague, aimless manner, but can offer no resistance. This done, the fly returns to her work as a mason. She prepares more clay and builds up the entrance to this ghastly cell. Then she commences a new cell, which she furnishes in like manner, and closes; then she adds yet another cell, and so proceeds until her store of eggs are all provided for, and her task in life being accomplished she dies, leaving her evil brood to hatch at leisure. In due time these horrid little maggots come to life and find themselves cradled in a larder of fresh meat. Each poor spider is still alive, and his juices afford nutriment for the ichneumon grub, until it is ready to pass into its chrysalis stage, thence to emerge as a winged fly, fully prepared to carry out the traditions of its ancestors with regard to spiders and fulfill the purpose for which they have been created, according to ichneumon belief.

The Smallest Insect Known.—The editor of *Insect Life*, in answer to a correspondent, says that, so far as known, the smallest true insect that has ever been described is *Alaptus excisus*, Westw., a minute parasitic Hymenopteron, which occurs in England. Its length is seventeen-hundredths of a millimeter, or from six to seven thousandths of an inch, and it is of slender form. This little species is probably parasitic in the eggs of some bark louse. It is quite likely that there exist other species still smaller, but if so they have escaped the eye of the entomologist up to the present time.

The Edible Qualities of Ants.—It has long been known that the formic acid present in ants in such quantity is normally of such strength that it is not disagreeable to the palate. As a boy, Mr. Howard, the entomologist, tried the experiment of crushing ants with sugar and water as a substitute for lemonade, and recollects that it was drunk with relish by his companions. A correspondent of *Insect Life* has written recently that one of her hired men is in the habit of eating large black ants found in rotten wood. She also states that her father, after eating a large section of railroad restaurant pie in the dark, and noticing an agreeable acid flavor, found that the remainder was swarming with specimens of the little red ant (*Monomorium pharaonis*), and that he must have eaten some hundreds of individuals. He was satisfied with his experience, which he did not repeat voluntarily, but he vouches for the edibility of this species. What the original ingredients of the pie were is not stated, but the effect of the combination was to make it about as sour as rhubarb.

Kyphosis Bicyclistarum.

One evil traceable to bicycling is the confirmed stoop which has already declared itself in many wheelmen, a result so common in the less strongly built bicyclists of the Continent as to have found its way into classification as the "kyphosis bicyclistarum."

The dorsal curvature posteriorly, which used to be rare in boys under 14 years of age, is, now that the bicycle is so largely used, very frequently met with, particularly among those young bicyclists whose spinal column is developing more rapidly than the ligaments and muscles, and in whose case, therefore, the equilibrium between those parts is more or less disturbed.

Were it merely an unsightly deformity, the stoop in question ought to be combated in every way; but confirmed dorsal curvature posteriorly has consequences of its own quite mischievous enough to call for immediate counteraction. The displacement, embarrassed functional activity, and arrested or diseased development of these organs, which kyphosis inevitably induces, are all too serious to warrant the slightest neglect in remedying them.

Exercise of a kind to accustom the spinal column to an action directly antagonistic to the inclination forward of the bicyclist's attitude is what is needed. The use of the Indian clubs or such similar means of incurvating the spine anteriorly, throwing out the chest and maintaining the head erect, should be practiced with that object. All the undoubted advantages of bicycling may thus be retained, without that cultivation of the stoop which tends to take a cubit from the stature of its inveterate exponents and to impose a hunchbacked development on what it would then be a figure of speech to call the rising generation.—*Lancet.*

The Great Seal Controversy.

Sir Charles Russell finished his long argument in the Behring Sea case recently. In concluding he said that this was the first occasion upon which a nation had claimed property in a free-swimming animal. The contention, he declared, was untenable, its advancement was derogatory to the principle of freedom of the seas, and it was extravagant and unfounded pretension that international law sanctioned the seizure and condemnation of the vessels of a friendly power. In his peroration he dwelt upon the importance of the arbitration submitted to by the two great powers, one representing Old World civilization, great in extent of dominion and greater in long-enduring traditions of liberty; the other a young but stalwart member of the family of nations, great also in territory and almost boundless in the resources, genius and enterprise of its people, and possessing enormous powers for good in the future of the human race. Their presence as friendly litigants, he said, was a fact of great moral significance, and their submission to arbitration was a victory for peace, as the award would be if it left the principles of international law untouched. Sir Charles was followed by ex-Attorney-General Webster, who insisted that the questions of rights and regulations were distinctly demarkated by treaty.—*Bradstreet's.*

THE tide tables for the Atlantic coast of the United States, together with 207 stations on the Atlantic coast of British America, for the year 1894, published by the United States Coast and Geodetic Survey, are now ready for issue, and copies can be obtained at the agencies of the survey in this city, or by addressing the office at Washington. Price 25 cents.

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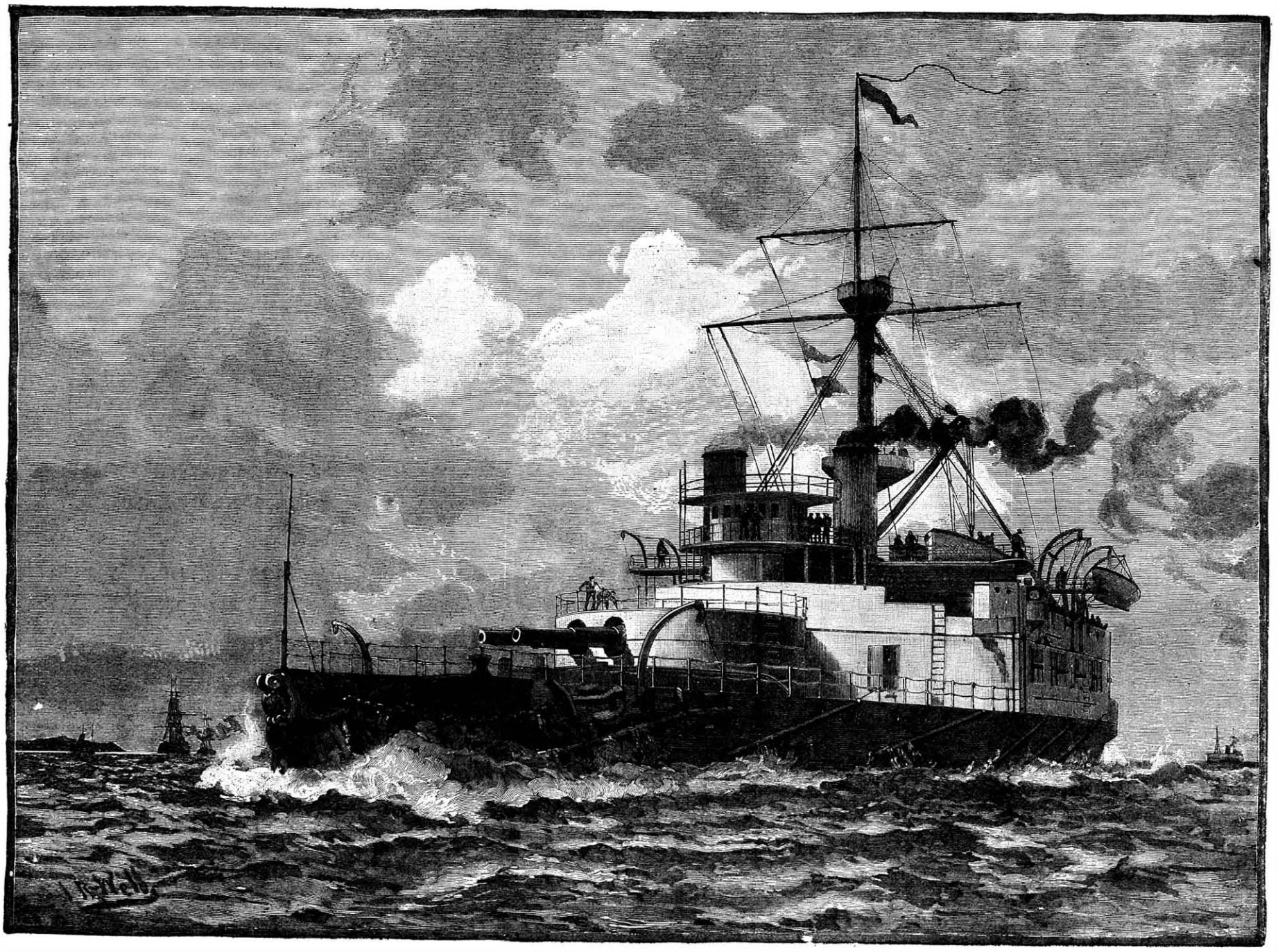
To Europe in Four Days.

Mr. J. H. Biles, the designer of the steamers Paris and New York, expresses in the *North American Review* the belief that within ten years a vessel can "leave New York at noon and arrive at Southampton at noon on the fourth day out." To do this, however, will require the enormous speed of thirty knots an hour.

For the attainment of this speed, Mr. Biles relies on no factors wholly untried, but on the adoption for ocean voyages of some that are now familiar but costly. The first is the further increase of mechanism in proportion to the total tonnage, by carrying a smaller weight of cargo and a larger weight of machinery. Could our fastest ships replace their cargo by motive power, they could add, says this accredited but highly sanguine critic, from one and a half to two knots an bour to their speed. Or if, instead of carrying 1,000 to 1,500 tons of cargo, as now, their capability was made less by 500 tons, replacing this by additional motive power, they would add a knot an hour to their speed. But it has not hitherto been deemed commercially wise so to sacrifice cargo to passengers and speed.



H. M. FIRST CLASS BATTLE SHIP VICTORIA, RECENTLY LOST OFF TRIPOLI.—[See page 2.]

We shall not stop to consider the reduction of the voyage by running to Halifax instead of to New York.

A second and a great source of gain, then, is in the lightening of the engines and other paraphernalia of power through the use of a lighter metal, such, for example, as nickel steel. This now costs much more than mild steel, but is 40 to 50 per cent stronger; it also costs no more now than that steel did in 1875. If this metal can replace steel in our best vessels, it will add, according to Mr. Biles, a knot an hour.

The process of getting more work out of the same weight of machinery also goes on gradually, while as to boilers there is hope of a far more important advance. Even now some types do three times as much work per ton as others, but could a light boiler be found that would do as good work, this problem of gain would be solved. If the locomotive type of boiler, which is one of the lightest of tubular boilers, or those having the fire inside the tubes and the water outside, give on long voyages two-thirds of their relative superiority on trial or as used in torpedo boats, another gain of over a knot an hour will result. There are also the tubulous boilers, with the water inside the tubes and the fire outside, whose performance, says Mr. Biles, "in relation to weight is much better than any of the tubular type;" and their development, which is especially looked for in America, will certainly bring higher speed.

Then there is fuel. Improved combustion by forced draught and other devices may be counted upon, but should oil be substituted for coal, the weight carried will be reduced one half, and this saving alone will give "a knot and a half more speed." The oil costs more, and this cost would increase when the supply diminished with the enormous quantities used by steamships; and it would also be necessary to accustom passengers to the idea that the oil is safe as a fuel.

Bigger ships will also be faster. Length is most important for this purpose, and some forms of vessels can actually be made to go faster with the same engine power by adding to their length, though this is not true of our best Atlantic liners. Yet even with the latter an addition of fifty feet would require only four per cent more engine power to attain the same speed, and would yield ten per cent more money-earning capability. As to draught, an increase from the usual twenty-six feet to thirty feet would add one and a quarter knots more, with a gain of eight hours on the run across. But, of course, in this matter, harbor and dock facilities must be considered.

In fine, should nickel steel be cheap enough for use in engines and should a light boiler be secured for long voyages, the speed may be increased by two knots, while oil as fuel would carry the gain to three and a half, which would reduce the time record between Sandy Hook and Queenstown from five days fifteen hours to four days sixteen hours. Increase the length of the vessel to 1,000 feet, its width to 100, and its draught to 30, and it will make 30 knots an hour, and "be capable of crossing the Atlantic in a little over four days."—*N. Y. Sun.*

Boiler Covering and the Consumption of Coal.

Some experiments on the influence of boiler coverings on the consumption of fuel have just been concluded on the railways of southwest Russia. It was found that cooling was more rapid while working than when stationary, save when a double covering of felt was used. The heat lost in twenty-four hours by a boiler with 30 square meters of surface containing water at a temperature of 144°, and exposed to an exterior temperature of 8·5°, corresponded to 133 kilos. of coal if the boiler were uncovered, to 153 kilos. if there were a thin metal covering, to 130 kilos. if there were a double felt covering, and to 103 kilos. in the case of a cork covering. For an average daily consumption of 1,164 kilos., the cooling of the boiler represented about 24 per cent and 8·1 per cent of the consumption of coal.

The Most Costly Light Known.

Perhaps the most costly artificial light ever produced as an incident of scientific research, the *Journal of Gas Lighting* says, is that of the diamond burning in oxygen, as exhibited by M. Moissan in the course of his investigations into the different peculiarities of the diamondiferous forms of carbon. The action of oxygen upon the diamond has long been known; but hitherto no precise data concerning the temperature of combustion has been obtained. In order to ascertain the missing information, M. Moissan has employed a modification of the Le Chatelier pyrometer, placed along with the diamond in a wide porcelain tube closed at the end by glass plates through which the combustion in oxygen could be observed. It was first found in this way that, when the temperature is slowly raised under these conditions, the combustion of the diamond proceeds slowly, without the production of light. But if the temperature is raised to forty degrees or fifty degrees above the point at which this slow combustion commences, a sudden incandescence occurs, and the diamond appears surrounded by a brilliant flame. Various deeply colored specimens of diamonds burnt with production of incandescence and flame at temperatures of from 690 degrees to 720 degrees C.; but transparent Brazilian diamonds did not attain the stage of slow combustion without incandescence until the temperature of 760 degrees to 770 degrees C. was reached. Specimens of exceedingly hard bort commenced to combine with oxygen at 790 degrees C., and burnt brilliantly at from 840 degrees to 875 degrees C. When Cape diamonds were heated to a temperature of 1,200 degrees C. in a current of hydrogen, they remained unchanged; but if the stones had previously been cut, they frequently lost their brilliancy and transparency. It is a curious fact that metallic iron at its melting point combines with the diamond in a most energetic manner, and crystals of graphite are deposited in the mixture as it cools. Hence the experiment forms a striking mode of converting the allotropic form of carbon, which crystallizes in the cubic system, into that which crystallizes in the hexagonal system.

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RECENTLY PATENTED INVENTIONS.

Railway Appliances.

CAR BRAKE.—Albert H. Kirker, Avalon, Pa. This brake is provided with two differential brake levers adapted to be connected with a pair of brake beams, a bar pivotally connecting the levers with each other near the beams, and a link connecting the free ends of the levers with each other. This improved brake is of simple and durable construction and applicable to all kinds of cars, the connected differential brake levers affording means for applying the brake shoes on heavy cars with great power.

CAR COUPLING.—William B. Yates, Bucoda, Washington. In this coupling the drawbar has a main section and a side section bolted together and arranged at their front ends to form jaws, between which the drawhead is horizontally pivoted and provided with a depending integral link. The construction is simple, and is designed to obviate all danger of injuring the fingers or hands of trainmen, and to facilitate the coupling together of cars of different height, while it permits of convenient coupling with an ordinary drawhead as well as with another of the same kind.

Miscellaneous.

PIPE JOINT.—Charles C. Merrill, Riverside, Cal. The pipe sections are made with a screw-threaded socketed connection and annular internal recesses where the ends of the sections abut, a split ring being embedded with a suitable cement in the recess formed by the two recesses, with its inner face flush with the inner surfaces of the pipes. The joint is especially designed to use with vitrified clay pipes and similar pipes and tubes, employed for conveying liquids under high pressure.

CALIPERS.—Johann C. Reimann, Union, N. J. The body of this device, to which the arms are pivotally connected, has scales arranged upon the arc of a circle, and reading in opposite directions, indicators connected with the arms traveling one along each scale. The device is simple and durable and is more especially adapted for use in measuring a horse for a collar. The calipers are so made that they may be folded when not in use and readily carried in the pocket.

COIN DETECTOR.—Edgar H. Cook, Brooklyn, N. Y. This is an improvement adapted for application to coin-operated or nickel-in-the-slot machines, for guarding the mouth of the coin chute, and detecting and rejecting all coins of the wrong size, and all rubbish, such as washers, buttons, etc. The invention covers various novel features and combinations of parts whereby the appropriate coin may be conveniently deposited in the chute, but designed to make it practically impossible to deposit any other article.

HOSE COUPLING.—Philip H. Dencer, Sprague, Washington. This is a coupling that will not leak, for quickly and conveniently uniting sections of fire and other hose. It consists of two ring-shaped sections having upon one side a loose hinge joint and on the other side means for drawing together and locking the two sections. There is a lip or shoulder on one section, and a lever hinged to the other section has an elbow adapted to bear against this lip to draw the sections together, there being also means for locking the lever in its closed position.

HAND PUNCH.—Wilson Carey, Forest Hill, Cal. In this punch one arm terminates in a sleeve to which is fitted a boss to receive tubular punches, a bolt in the sleeve extending over the inner ends of the punches to force out small pieces of leather or other material removed by the punches. The tool is especially adapted for making holes in leather, cloth, rubber, etc., and its construction insures equal pressure on all portions of the end of the punch, avoiding the lateral strain common to punches in which both jaws have a swinging motion.

CIGAR BOX.—Oscar Kunzell, Dusseldorf, Germany. This box is divided into a series of parallel compartments open at both ends, fabric membranes adapted to be punctured closing both ends of the series of compartments, so that the finger may be pushed through one membrane to force the desired article from its compartment and through the opposite membrane. The membrane is preferably of soft paper, the latter for protection covered with thin boards, to be removed before any articles are taken out.

GAME APPARATUS.—Edgar L. Williams, Peoria, Ill. This apparatus comprises a board held upon a suitable supporting frame and provided with a group of holes near the center and holes near the ends, open-arch wickets secured to the board extending over the holes. Transverse lines divide the board into compartments, and counters or chuckers are snapped from one end of the board, the player endeavoring to snap the counter through one of the wickets and into one of the holes, the counting varying for different holes.

BOWLING ALLEY ATTACHMENT.—James H. Winn, Winchester, Mass. This is a device for checking the speed of balls returned through the trough of the alley, thus preventing injurious percussion of the balls on each other. It consists of a pivoted, weighted tilting bar, longitudinally inclined above the trough in position to receive the impact of a ball at one end, and having its other end connected by a link with a shock-absorbing device.

ANIMAL TRAP.—James Alexander, Lakeview, Idaho. This is a simple, cheap, and very strong trap, in which the upper sides of the jaws are entirely free when the trap is set, and the trip plate lies very low in the trap, being pivoted in such a way that it cannot be readily broken. The trap is adapted to catch animals of almost any kind, the size of the opening through the trip plate being adjustable to expose more or less of the bait, as desired.

ELECTRIC CUT-OUT.—Patrick J. Barrett, Boston, Mass. This is a fuse box of simple construction, especially applicable to incandescent lamp circuits, but also suitable for other uses, and designed to carry a number of fusible conductors in such way that one will be brought into position to close the circuit after one or more of the others have been burnt out, as is liable to occur when the current is suddenly increased beyond a calculated limit. The invention provides for two forms of a device in which a drum carrying the fusible wires may be revolved or the fusible wires may be held in a stationary position and the contact brush for engaging them may be revolved.

RECORDER OR TELEMETER.—John T. Todd, Newman, Ill. This is a machine for automatically recording for any stated time the state or variations of any force, whether of temperature, pressure, or other changing agent, in any locality, machine, or apparatus. The recording receiver has a series of type wheels, the force-recording wheel being actuated by electro-magnets actuated from a transmitter according to the rise or fall of the temperature, or height of water, or pounds of pressure, etc., additional type wheels being used for two or more agents or forces, and the arrangement is such that a complete record may be made for any desired length of time of the changes which take place in the agents under observation.

MUSIC LEAF SUPPORT.—Adolph J. Lehmann, Liverpool, England. This device comprises an arm formed of a bowed strip or loop whose conveying ends are connected by a solid portion with a pivot aperture, and from which a weight depends, forming a counterbalanced support to be engaged by the leaves while being turned. The device is very simple, and may be readily carried in the pocket, or the counterbalanced loop may be attached pivotally as a fixture to a music rack.

EYEGLASSES.—Adolphus J. Landry, Boston, Mass. This invention provides a novel construction of eyeglass frames of the sliding bar type, subject to the control of a spring, whereby the lenses are made readily or automatically adjustable toward or from each other in a straight line. The construction affords great facility of adjustment, the frames being strong and durable, and holding the glasses very steadily.

PEN OR PENCIL HOLDER.—Charles Kertell, San Francisco, Cal. This is a holder and protector for various kinds of pencils, and for stylographic or fountain pens, being adapted to be secured in a pocket to hold the pen safely when not in use and protect its point from injury. It consists of a tubular elastic sheath, tapered and closed at the lower end and open at the upper end, in connection with a device for attaching the sheath to a garment.

PIPE HANGER.—John H. Hunter and Friedrich Cajar, New York City. A single rod or wire is bent to form end clasps and an intermediate loop or coil adapted to receive a pipe, the material forming the end clasps being bent outward from the coil and returned on itself, and having eyes at its terminals to afford a broad bearing. The device is more especially designed to facilitate the suspension of metal or other pipes from beams, the hanger being inexpensive and elastically adjustable in its limbs that engage the parts of the beams from which the pipe is to be hung.

LAMP CHIMNEY ATTACHMENT.—Kinner N. Hollister, Delavan, Wis. A piece of wire is bent to form a series of horizontal arms or stretchers, coiled at their ends and crossing under or over and bracing one another, and terminating at their center in a downwardly projecting hollow and open screw. The device forms a convenient rest or support and guide for heating different bodies or vessels by the lamp flame, especially for heating curling irons.

WATCH CASE SPRING.—Victor Nivois, Brooklyn, N. Y. This improvement combines in one piece a dust band, lift spring, and release spring, the parts being so united that they may be produced from a single piece of metal, and when formed may be quickly, conveniently, and accurately fitted in the center of the case, avoiding the use of a number of springs, and the expense and time of attaching a lift spring to an encircling band or spring for a center.

SEWAGE TREATING APPARATUS.—James J. Powers, Brooklyn, N. Y. A tank is made in duplicate, each half provided with labyrinthic sluiceways for the passage of sewage, and in combination with the sluices are wires and screens for holding back the solid matter, and dip boards for retaining oily matter and other floating substances. Apparatus is also provided for introducing chemicals to purify the sewage before it is discharged, there being a receptacle for the treated sewage, and an automatic discharge siphon.

GLASS CARRYING VEHICLE.—Robert M. Roberts, Anderson, Ind. This is an improved apparatus for conveying glass cylinders from the point where they are blown to the place where they are to be further operated upon. The main wheel is provided with a cushion which will not be cut by glass, and the cylinder-carrying belts are so arranged and supported that the cylinders cannot be jarred and broken. The main frame is also so suspended as to be springy and easy, to avoid any sudden shock to the glass cylinders carried.

TREE SUPPORT.—William H. Cook, Riverside, Cal. This support comprises a pole, adapted to be fastened by straps to the trunk or branches of a tree, or to be set in the ground, a frame and sliding sleeve being held adjustably on the pole, a flange of the sleeve being adapted to be engaged by a cable, wire or rod. The device is simple and easily applied, and is designed to securely prop up and support heavily laden branches of fruit trees, etc., and for training shrubbery.

FIRE ESCAPE.—Charles Dobbs, Nevada, Texas. The folding ladder type of escape has been improved by this inventor, who has designed a construction comprising a series of like sections, each composed of two side bars laterally bossed on like edges at their ends, the sections having transverse rungs and being loosely connected at their ends by pivoted link plates. The parts fold together compactly, and the ladder is designed to be kept in an upper room, and as it is dropped the parts unfold by gravity and fall into position for use. The construction is such that the ladder is held away from the wall, and a duplicate ladder may be attached when necessary.

TOBACCO PLIERS.—Milton B. Hatcher, Augusta, Ga. This is an implement to facilitate the removal of plug or slab tobacco from the box. It has two crossed and pivoted handle members, a depending curved rack being formed near the end of one of the members, while near the end of the other member and between the jaws is pivoted a curved toe having teeth to engage the rack. By inserting the sharp end of the toe between the end of a plug or slab and the side of the box, a powerful purchase is obtained when the handles are gripped tightly together.

GRAIN PURIFIER.—Frank M. Schell, Perry, Kansas. To facilitate the cleaning and polishing of wheat, corn, rye, oats, barley, and other grain, is the object of this invention, the purifier having a casing with upper and lower suction chambers, between which is a fan box arranged in a cylinder, there being a lower finishing chamber provided with a screen or sieve and a revolving brush, while a pipe connects the screenings box of the finishing chamber with one of the fan suction tubes. A yielding surface concave and head are operated in the cylinder above the fan box to thoroughly separate the grain, hulling white caps, mashing soft grains, etc., and put the grain in condition to be efficiently acted on by the suction.

HOISTING APPARATUS.—Noble H. Gilmore, Greenville, Mich. An arrangement of draught equalizing pulleys below and as an attachment of the upper pulley block of a compound pulley system is provided by this invention. It comprises equalizing pulleys journaled in a frame permanently attached to the frame of the upper pulley block, in connection with a chain which runs on the several sheaves of the system, the improvement being designed to obviate the greater friction, draught and wear incident to the ordinary compound pulley system.

WINDOW CORNICE AND CURTAIN SUPPORT.—Jeremiah M. Hoffman, Cressona, Pa. This improvement provides for adjustable fastening devices at each end of the cornice body on the inside of a window, the devices to be operated in unison, and the cornice body being readily connected to windows of different widths. Combined with the cornice supports there are also adjustable curtain-holding brackets and lambrequin supports, the construction being such that the devices can be produced at small cost, and placed in position and adjusted by anyone, without the employment of screws, nails, or tools of any kind.

COKE OVEN.—George W. Nixon, Chattanooga, Tenn. This is a traveling oven, arranged to receive its charge from the chute of a coal bin, and, after the coking has progressed to a certain degree, the oven is hauled on its own wheels over a suitably arranged track to the top of a furnace, where the still burning contents are discharged, the same general construction being followed where the contents are to be dumped into a stock pile. The oven has a dome-shaped top, lined with fire brick, a layer of which material is also applied to the base, the dome being hinged to the rear edge of the base, so that the two may be opened to discharge the coked contents.

GAS STOVE.—Anton Weiskittel, Baltimore, Md. This invention provides a cock or fitting consisting of a pipe section having a controlling valve with a handle projecting to one side and a laterally projecting section on the opposite side, a vertical section carrying a burner tube valve being jointed on and turning in the latter section, whereby a single fitting furnishes the controlling valve and ignitor tube and valve, the manipulation of neither the controlling valve nor the ignitor or its valve interfering with the manipulations of the other part.

BOOT OR SHOE.—William Wass, Philadelphia, Pa. This is an improvement in boot or shoe heels provided with detachable wear plates, one plate secured to the leather, having a recess with under-cut walls and lugs on its lower surface, while the other and outer plate has a locking button adapted to enter the recess, a binding screw connecting the two plates. This protecting plate may be cheaply manufactured, and the plates are quickly and easily applied.

Designs.

PENHOLDER.—Dent L. Lydick, Quaker City, Ohio. This holder simulates an oar bearing on one side of the blade an illustration of the three ships of Columbus on the sea.

FLOWER BED SUPPORT FOR GRAVES.—George W. Burns, Troy, N. Y. This design represents a bed, at the head of which appears an angel with an open book, while at the foot is a smaller figure of an angel blowing a horn, there being also crosses on the side pieces.

NOTE.—Copies of any of the above patents will be furnished by Munn & Co., for 25 cents each. Please send name of the patentee, title of invention, and date of this paper.

NEW BOOKS AND PUBLICATIONS.

HICKS' BUILDERS' GUIDE. Comprising an easy, practical system of estimating material and labor for carpenters, contractors and builders. By I. P. Hicks. New York: David Williams. 1893. Pp. 160. Price $1.

The subject of house building, framing especially, is the subject of this work, with special view to the estimation of material and labor used in structures. The system seems excellent and simple and the book may be confidently recommended to the trade.

HISTORY OF THE MASTER BUILDERS' EXCHANGE OF THE CITY OF PHILADELPHIA. By Clem. H. Congdon. Illustrations by William W. Morgan. Philadelphia: Sunshine Publishing Company. 1893. Pp. ix, 493.

While the subject of this work would seem to be a very local one, and while its text is certainly of rather restricted interest, the fact that the work is illustrated by very beautiful half tones of the different habitations of men, as shown at the Paris exposition of 1889, gives it an interest of its own. The subject of trade schools receives considerable space, which subject, of course, is one of universal interest.

THE MANUFACTURE OF LIQUORS AND PRESERVES. By J. De Brevans, Chief Chemist of the Municipal Laboratory of Paris. New York: Munn & Co. 16mo. Pp. vi, 200. 65 illustrations and 18 tables. Cloth. 1893. Price $3.

A practical work on the manufacture of liquors which by its price would be within the reach of all has long been wanted. The present work is by an eminent French chemist who has devoted much time and study to the preparation of liquors and preserves. The great value of the work consists in the formulas, which number over 300, and are so arranged that, if the manufacturer has no distilling plant of his own, he can still make many of the liquors from the essences. The manufacture of French *liqueurs* from essences is very profitable and does not require large capital. The raw materials, the plant of the distiller, etc., are described according to the best modern practice. The book is well illustrated and is accompanied by valuable tables and a very full index. Table of contents sent free on application.

JAHRBUCH FUR PHOTOGRAPHIE UND REPRODUCTIONSTECHNIK. By Dr. Josef Maria Eder. Halle'an der Saale, Germany: Wilhelm Knapp. 1893. 145 woodcuts, zinc plates and 34 artistic tables. 586 pages.

The seventh yearly volume of the above entitled work has recently been issued, and it contains 84 original contributions from the best writers and covering all subjects relating to photography. A retrospect of the progress of photography during the years 1891 and 1892 by the well known author, Dr. Eder, together with a list of the several patents which have been granted on photography in Austria and Germany during the year 1892, concludes the volume. The publisher has done great credit to himself by the addition of the beautiful plates covering the various processes of reproduction known in photography.

DIE BEKAMPFUNG DER STURZWELLEN DURCH OEL. By Joseph Grossman, Engineer. Vienna: Carl Gerold's Sohn. 1892. 140 pages.

The book gives a short history of the use of oil on the tronbled waters of the sea, and cites in the beginning Aristotle, Plutarch, and Plinius, to whom this property of oil was, apparently, known. The author treats, in a very intelligent manner, the value of the use of oil on board of marine vessels to quiet the sea, also the oil almost serviceable for the purpose.

☞ Any of the above books may be purchased through this office. Send for new book catalogue just published. MUNN & Co., 361 Broadway, New York.

SCIENTIFIC AMERICAN BUILDING EDITION.

JUNE, 1893.—(No. 92.)

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1. Elegant plate in colors, showing the residence of Joseph P. Beach at Pine Orchard, Conn., erected at a cost of $1,200 complete. Floor plans and two perspective elevations. Messrs. Munn & Co., architects, New York.
2. Plate in colors showing the handsome residence of Seward W. Jones, at Newton Highlands, Mass., erected at a cost of $9,000 complete. Perspective view and floor plans. Messrs. Rand & Taylor, architects, Boston, Mass. An attractive design.
3. A handsome colonial dwelling on Beacon Hill, Boston, Mass. Two perspective views and floor plans. A model design. Messrs. Shepley, Rutan & Coolidge, architects, Boston, Mass.
4. A Colonial residence dwelling at Montclair, N. J., erected at a cost of $5,500 complete. Floor plans, two perspective view, etc. Messrs. Munn & Co., architects, New York. An excellent design.
5. Engravings and floor plans of a dwelling at Elm Station, Pa., erected at a cost of $5,200.
6. A dwelling erected near Longwood, Mass. A modern design. Mr. Austin W. Pease, architect, Boston, Mass. Floor plans and perspective elevation. Cost about $2,200.
7. The First Congregational Church at Plainfield, N. J., erected and furnished complete at a cost of $15,000. Mr. Oscar S. Teale, architect, New York City. Perspective and floor plans.
8. A residence at Beardsley Park, Bridgeport, Conn. A very picturesque design, perspective elevation and floor plans. Cost $5,500 complete. Mr. A. H. Beers, architect, Bridgeport, Conn.
9. Views showing the exterior of the twelve story Boyce Building, at Chicago, put up in thirty-nine days. The cost of the structure was $300,000.
10. The Fifth Avenue Theater, New York.—Views of the auditorium, the Broadway lobby, the Twenty-eighth Street foyer. Mr. Francis H. Kimball, architect, New York.
11. Miscellaneous Contents: New lien law in California.—An improved spring door hinge, illustrated.—To estimate brick work.—Foul water main.—An improved woodworking machine, illustrated.—An improved scaffold truss, illustrated.—Sawdust building bricks.—Some beautiful arch work, illustrated.—Mineral wool in buildings.—Wood mantels, illustrated.—Sound tiles for real estate.—Durability of cedar.—Tin from tin scrap.—Improved steam heater, illustrated.

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Notes & Queries

HINTS TO CORRESPONDENTS.

Names and Address must accompany all letters, or no attention will be paid thereto. This is for our information and not for publication.

References to former articles or answers should give date of paper and page or number of question.

Inquiries not answered in reasonable time should be repeated; correspondents will bear in mind that some answers require not a little research, and, though we endeavor to reply to all either by letter or in this department, each must take his turn.

Special Written Information on matters of personal rather than general interest cannot be expected without remuneration.

Scientific American Supplements referred to may be had at the office. Price 10 cents each.

Books referred to promptly supplied on receipt of price.

Minerals sent for examination should be distinctly marked or labeled.

(5151) C. W. S.—The care of a gravity cell is very simple. Two things are necessary; one is to keep the zincs clean, the other is to keep the line of demarkation of the copper solution and the zinc sulphate about half way between the zinc and copper solutions of the battery. This you can do by regulating the resistance of the circuit. If you find your cells running down too rapidly, connect them up in series of two or three in parallel; if on the other hand, level of the blue liquid rises into close proximity with the zinc, it indicates too much resistance in the circuit, the remedy for which is obvious—to decrease the resistance of the external circuit.

(5152) J. J. M. says: Some time ago I saw a man who made it his business writing names and designs on glassware. I am acquainted with the process using the vapors of fluoric acid, but this man used a fluid with pen and brush. Would you kindly let me know under queries of your valuable paper what kind of a solution he probably used? A. 1. The preparation may be made by mixing sulphate of barium and fluoride of ammonium in the proportion of three parts of the former to one part of the latter, with sufficient sulphuric acid to decompose the ammoninm and bring the mixture to the consistency of rich milk. The mixture should be made in a receptacle of lead, and kept in a bottle of the same material, or of gutta percha. 2. Since fluoric preparations have been produced at reasonable prices the decoration of glass by their means has steadily made its way. Etched glass is now to be found everywhere, and glass etching runs glass cutting very hard. It is very easy to understand that well etched objects appear actually more beautiful than those which have been cut. The cost of production is cheaper, and since M. Hock, a Viennese chemist, has given us an elaborate work upon the technics of glass etching, the difficulties attending this kind of work have been reduced to a minimum. As is well known, fluoric acid usually etches smooth, while other fluoric preparations yield a matt surface. The most beautiful ornamentation is obtained when certain parts of the glass surface are rendered matt by means of flouride of ammonium which has been slightly acidified by means of acetic acid. The matt appearance is not always the same with different kinds of glass, but varies much in beauty. This effect is governed by the composition of the glass, lead glasses being easily acted upon and furnishing a very fine matt surface. 3. Where it is desired to have the surface of the glass not altogether matt, but shining like ice, as in the case of window glass, this may be attained in a simple manner by placing the glass plate in a perfectly horizontal position and covering it with fine groats. Then very dilute fluoric acid is poured upon it. The groats act as a shield and produce upon the glass raised points.—"Cyclopedia of Receipts, Notes and Queries."

(5153) J. M. says: Will you please advise a subscriber how to finish an oak front to a dwelling that is exposed to the weather, where the finish will stand any reasonable length of time and not come off, bleach out and fade? All fronts to dwellings and stores in this part of the State that I have noticed do not stand the weather. Also please advise how to make a glue that will hold a joint that is exposed to the weather. A. An oak front should be thoroughly oiled with raw linseed oil as soon as finished, and rubbed down with woolen cloths. In a few days, or as soon as the raw oil has struck in and dry enough, apply a coat of boiled linseed oil, and when dry a second coat. A good weather glue is made by boiling the glue with skimmed milk, in the proportion of half a pound of dry glue to a quart of skimmed milk. Swell the glue in the milk before boiling.

(5154) P. McL. writes: I am about to erect two batteries of boilers, four boilers in each battery. Size of first battery 26 feet long by 38 inches diameter, two 15 inch flues in each boiler. Size of second battery 32 feet long by 42 inches diameter, two 15 inch flues in each boiler. Will you please through your Notes and Queries inform me the distance grate bars should be below shell of boiler, also distance from bridge wall to shell of boilers, depth of combustion chamber, and style of back wall, whether staight wall or should it be racked off in front? Boilers to burn Pittsburg coal and can use all steam they can make. Also please give me height and diameter for iron smoke stack for each battery? A. The grate for soft coal should be 3 feet below boilers in both batteries. Bridge wall, one foot below the boilers. Size of grate for each boiler of the first battery should be 40 inches wide, 4½ feet long. Size of grate for each boiler of second battery should be 44 inches wide, 5 feet long. Bridge wall should be vertical for 9 inches above the grate, then racked off or beveled to the top at about 45°. Iron smoke stack of first battery 38 inches diameter by 60 feet in height. For second battery 44 inches diameter by 60 feet high.

(5155) F. W. M. asks: Is there any need of a flux in casting brass? If there is, what is the best to use? A. No flux is used in casting brass. A little powdered charcoal is put on the surface in the crucible to prevent oxidizing.

(5156) J. J. P.—We do not think a fan blower is adapted to organ blowing, on account of the vibration of the column of air, which would affect the sounds produced by the pipes.

(5157) C. H. asks: 1. I have just made two storage batteries, 4 plates, each 4×5 inches, coated with red lead mixed with sulphuric acid and water. I want to charge them from a 50 volt, 16 candle power socket. Is the voltage too high? A. By introducing your battery, together with some resistance, into your 50 volt circuit, you can charge it. 2. How can I reduce the voltage from the socket low enough to charge the cells to the best advantage? A. Use a wire rheostat or a bank of lamps for resistance. 3. How many gravity batteries will it take to charge the storage batteries so as to burn a 1 candle power lamp 15 to 20 minutes each evening, using the gravity cells during the day time to charge them? A. Four gravity batteries to each cell of sto age battery. The proposed lamp is rather small; you might use 2 or 3 cells with a larger lamp and run it for a much longer time.

(5158) W. M. writes: I have constructed a pair of receivers of the Bell telephone pattern, merely as an experiment. When I tried them I found that the sounds were very low and indistinct. Can you tell me what the cause of this is? A. Possibly you may have placed the diaphragm at too great a distance from the pole of the magnet, or you may have used a weak magnet. Possibly you have not sufficient length of wire on your spools, or the wire may be short-circuited.

(5159) B. M. C. V. asks: 1. What is the rule to know the charging time of a given accumulator? Has the number of plates anything to do with it, or the surface of the plates as represented by square inches? A. Charge your batteries until the positive plates look like wet slate nearly black; when partly discharged they become dark red, chocolate or plum color. It requires about 7 or 8 hours to charge a battery. 2. I have an accumulator for medical use, composed of four separate accumulators to be charged, connected in parallel with 2 Bunsens 20 cells for 8 hours. I want to know how many hours it will take to charge them with 4 telegraph cells? A. Four gravity cells to each cell of storage battery will charge storage cells in about the same time, 7 to 8 hours. 3. I have two large Bunsens (2 gallons) with two zinc plates each; one of the plates in each cell is nearly destroyed by little use. The connections are properly made, the 2 zincs in each cell and one of them with the carbon of the neighboring cell; the plates are thoroughly amalgamated, the screws firmly attached, nevertheless the browsing is very strong in both the mentioned plates. Can you help me with your advice in preventing such a trouble? I use for charging 1 part strong sulphuric acid to 12 of water by volume. A. The only way to prevent the destruction of the zincs is to remove them from the cell when the battery is not in use. 4. How can I know the amperage and ampere hours of a given accumulator? A. You can determine this only by trial, or addressing the maker, if it is one which is on the market.

Replies to Enquiries.

The following replies relate to enquiries published in the SCIENTIFIC AMERICAN, and to the numbers therein given.

BORING GLASS.—In the May 6, 1893, number of the SCIENTIFIC AMERICAN, a correspondent, M., tells of a very good way to drill glass plate. His methodis a good one, but if a saturated solution of camphor in turpentine be used as a lubricant, the drill will cut more rapidly.—C. R. JOHNS, M.D.

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June 20, 1893,

AND EACH BEARING THAT DATE.

[See note at end of list about copies of these patents.]

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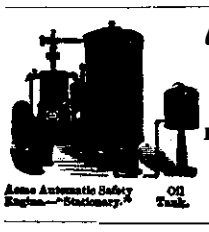
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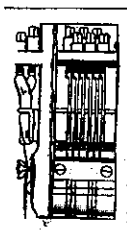
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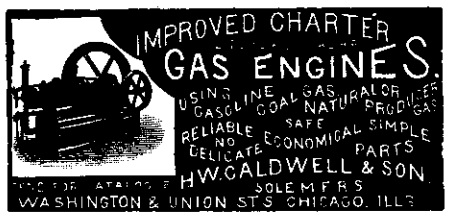

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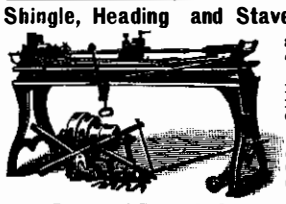

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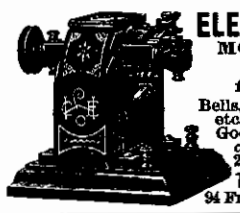

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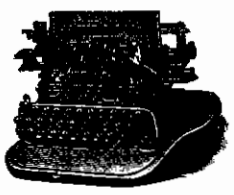

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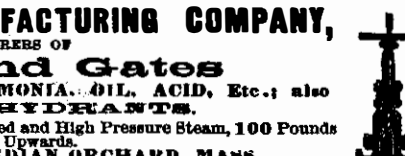
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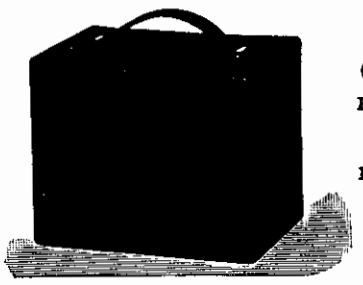

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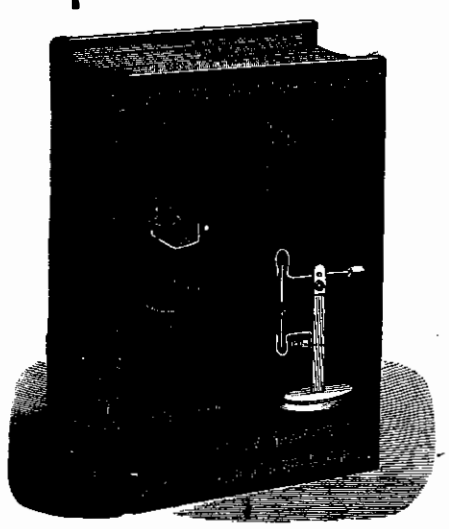

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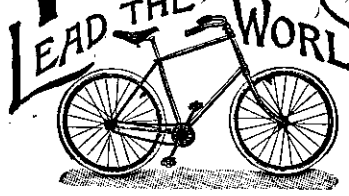

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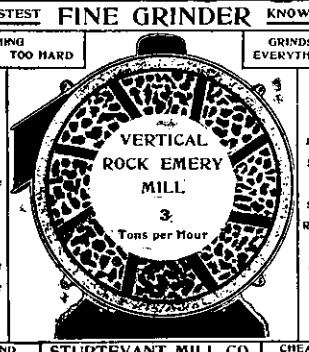

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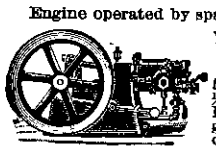

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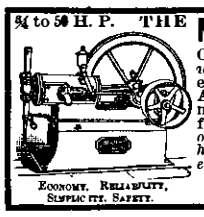

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This Company owns the Letters Patent No. 186,787, granted to Alexander Graham Bell, January 30, 1877, the scope of which has been defined by the Supreme Court of the United States in the following terms:

"The patent itself is for the mechanical structure of an electric telephone to be used to produce the electrical action on which the first patent rests. The third claim is for the use in such instruments of a diaphragm, made of a plate of iron or steel, or other material capable of inductive action; the fifth, of a permanent magnet constructed as described, with a coil upon the end or ends nearest the plate; the sixth, of a sounding box as described; the seventh, of a speaking or hearing tube as described for conveying the sounds: and the eighth, of a permanent magnet and plate combined. The claim is not for these several things in and of themselves, but for an electric telephone in the construction of which these things or any of them are used."

This Company also owns Letters Patent No. 463,569, granted to Emile Berliner, November 17, 1891, for a Combined Telegraph and Telephone; and controls Letters Patent No. 474,231, granted to Thomas A. Edison, May 3, 1892, for a Speaking Telegraph, which cover fundamental inventions and embrace all forms of microphone transmitters and of carbon telephones.

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